The
Electrical Review

VOL. CXXIII JULY 8, 1938. No. 3163

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

THE ELECTRICAL REVIEW, DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1.

Telegraphic Address: "AGEEKAY, SEDIST, LONDON." Code, A B C. Telephone No.: Waterloo 3333 (50 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades and has by far the largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to ELECTRICAL REVIEW, LTD., and crossed "Lloyds Bank."

Classified Advertisements-Official Notices-Tenders—Supp. 15.

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Rough Justice for Electricity Supply

What is "elasticity"?

LAST year the average fuel consumption per kWh sent out from stations controlled by the Central Electricity Board was less by nearly 17 per cent. than it was five years earlier under independent operation. Nevertheless, the cost of coal per kWh was only 3 per cent. below the 1932 figure, since in the meantime its price had risen by 17 per cent. In other words, one of the two main achievements of the grid, which cost some £30,000,000 to construct, has not benefited consumers of electricity but the mining industry.

Electrical men might be disposed to regard a payment of £1¾ million or more per annum as a handsome enough contribution towards an attempt to put the coal mines in order. Any such ideas they may have will, however, be rudely dispelled if they take seriously some of the opinions expressed in the latest P.E.P. broadsheet, "The Struggle over Coal," which deals with "coal politics" since 1935.

In this document discriminative increases in the price of coal to public utility undertakings are defended on the ground that the coal industry, prior to central selling in 1935, was "forced" to sell coal to such bodies at prices that made only a meagre contribution to the cost of production. The compulsion, it is said, came from the superior bargaining power of the public utilities in placing long-term contracts and playing off one coal supplier against another. Just as they do in the case of electrical manufacturers, in fact!

As colliery owners must live, they have "taken it out of the weakest customer—the household consumer," who is thought to have received very rough justice. The implication of this—that a high price is paid for small quantities in order to subsidise bulk customers, ignoring distribution and other commercial factors—has a familiar ring. It is reminiscent of the old fallacy that householders who use electricity for lighting only (and have many votes) pay a high rate because the relatively few large power users pay a lower rate. Electrical men might, therefore, regard this as coming under the heading of "politics" (with which this broadsheet deals) and leave is at that.

They would be wrong, however. The authors back their views with an "economic" argument. They say that, before organised selling came in, the coal industry "pampered the inelastic consumer and browbeat the elastic consumer." The emotional choice of verbs in this sentence indicates at once which is which. The "elastic" consumer, *i.e.*, the one who tends to reduce his consumption with a price increase, is considered to be the possessor of the domestic hearth. The "inelastic" consumer, who would not materially reduce his demand on account of price increase, is the public utility.

What, then, do the compilers of this document suppose electricity supply undertakings do with their coal? Actually, of course, they turn 15 million tons a year into electricity and so distribute coal in a refined form, instead of sending it round in carts. The convenience and cleanliness of electricity justify its higher cost, but these advantages (being in a sense "luxuries") are more likely to be sacrificed than is basic warmth, and this makes the demand for electricity far more elastic than the demand for raw coal. Moreover, coal in the form of electricity is used for many luxury purposes where raw coal would not be used, thus increasing the output of the pits.

As regards industry, increases in coal prices merely favour imported oil; hence the electrical load is lost to the coal industry. Apart from motive power, there are many large-scale industrial processes (for which raw coal is unsuitable) that require cheap electricity if they are to be developed at all in this country, and experience shows how great is the response in increased consumption of electricity to small variations in its price at near-coal figures.

Towards the end of this month will be held the first public meeting of the Committee on Methods and Cost of Distribution of Fuel, and anyone wishing to tender evidence is invited to communicate with the Secretary at Cromwell House, Dean Stanley Street, Millbank, S.W.1. We hope that no false assumptions regarding the elasticity of the electrical load and the ability of the supply undertakings to pay heavily for their coal will be allowed to cause further loss to the collieries as well as to the consumers of electricity.

International Electricity

THOSE who have helped, through the application of science, to provide fuller opportunities for mutual understanding between the nations are apt to be impatient at the misuse of the results of their labours. They also resent the Caliban-like attitude of those who blame them because what they had intended to be of world-wide benefit might be perverted to bring about world-wide disaster. Surely justification for this impatience and resentment is furnished by knowledge of what scientists and engineers would themselves make of international relations. A living example of what that means is provided by the International Electrotechnical Commission, of which the British Standards Institution makes up the British Committee. Recognition of the economic interdependence of nations, the Duke of Kent pointed out at the banquet given to the Commission last week, is necessary for its co-ordinating work to attain its highest value. If only politicians would discuss problems with the same consideration as electrical enginers it would, as Professor L. Lombardi said, dispose of most political troubles.

The "Southern" Goes Ahead

IN spite of the occasional jeremiads of the Railway Stockholders' Union on the subject of electrification, the Southern Railway pursues its programme of conversion. The latest addition, 75 miles, embracing a number of Sussex coast resorts, raises the total electrified route-mileage to 625. The new stock which has been put into service is really luxurious—particularly the handsome buffet cars—and the combination of electrification and modernisation of stock will doubtless fill the many extra trains which the company has been able to put on the routes. The electrical industry, no less than the Southern's passengers, has reason to be grateful for the enlightened policy which characterises this once-so-backward railway. It is to be hoped that the Southern's example will be duly noted by other companies which are still doubtful about the wisdom of electrification.

Railway Accidents and Fires

IN his report to the Minister of Transport on the collision of two trains at Castlecary between Edinburgh and Glasgow last December Lt.-Col. A. H. L. Mount deprecated any attempt to press railway companies to depart from their present methods of carriage construction, which embodies a substantial amount of timber. The substitution of electricity for gas in lighting, he says, materially reduces the risk of fire as the result of an accident. This consideration surely applies also to the use of electricity for cooking purposes on trains, which ought to be made a condition for permitting the continued use of wood.

Clean Boiler Houses

IN his article on a later page Mr. J. O. Knowles raises the question as to whether the present vogue for cleanliness in boiler houses is primarily due to utilitarian reasons. While it is far more pleasant to work under such conditions, consideration for the well-being of the staff is not the only point in favour of keeping things ship-shape against the handicap of coal dust and soot. It is within the experience of most engineers that, broadly speaking, the nearer the steam generating plant approaches the turbine-room in orderliness, the higher is the combustion efficiency. It may be said that modern installations are laid out with a view to making cleanliness easy, and that their thermal figures are naturally better. At least one old station springs to mind, however, in which a cleanliness drive has been followed by a notable reduction in the pounds of coal burned per kWh. Moreover, it has resulted in fewer men being required for cleaning and the transfer of those not required to more useful occupations. One great factor in the improvement has been the adoption by engineers of the principles of adequate and scientifically designed illumination that they have for so long advocated for others.

Splitting Nuclei

THE cyclotron, which is described by Dr. F. T. Wall in this issue, is used abroad in appreciable numbers. Its main advantage—an important one—lies in the small amount of space it occupies compared with that taken by other apparatus used for the disintegration of the nucleus by high-speed bombardment. Compactness of form is obtainable, since the high voltage is not generated in one stage, the particles travelling round and round in a strong magnetic field, each time receiving accelerating impulses. A disadvantage attending the use of the cyclotron, as mentioned recently by Professor F. A. Lindemann, is that it can deal with only one, or at most two, types of particle, but apart from purposes of fundamental research, its ability to produce large amounts of radio-active elements should give it scope in therapeutic applications.

A Bomb-proof Power Station

HYDRO-ELECTRIC plant is more easily protected from attack by air than steam plant is. Plans for the construction of a water-power station at Tröllhattan, Sweden, provide for sinking the intake conduits and the turbines at a steep angle in the granite rock, the whole—including the control sluices—being covered with a roof of concrete 10 ft. thick. The vertical generators are to be covered by a further 10 ft. layer of concrete which forms the turbine-house floor. Passages under the floor on each side of the generators will give access to these, and permit temporary connections to be made should those in the turbine house be destroyed. The inlet to the conduits consists of a gate of cylindrical section fixed to a pivot at the centre of the cylinder so that it can be rapidly raised or lowered to cut off the water from the plant. Large sluice gates in the main dam, which is some distance from the turbine house, would carry away the water rapidly in the event of the dam being bombed. The measures thus taken to avoid flooding of the plant would appear to be as important a part of A.R.P. as are those to protect the turbines from damage by bombs.

Gas Washing at Fulham

FROM the electrical point of view, the most interesting item in the Report on Alkali Works for 1937 (Stationery Office 1s.) is the reference to the remarkable efficiency obtained with the sulphur elimination plant at Fulham generating station during its first year of working. Rather more than 270,000 tons of coal were fired with an average sulphur content of 0.89 per cent. and 9.58×10^{10} cu. ft. at n.t.p. of flue gas was treated, the average CO_2 content being 12.5 per cent. From 700 works tests the total acidity of emissions, expressed as sulphur, was 0.0063 gr. per cu. ft. at n.t.p. showing that 2,370 tons of sulphur had been eliminated by the gas washing process. When corrected to a basis of 10 per cent. CO_2, the average acidity was reduced to only 0.0050 gr. per cu. ft. This is considerably less than any other figures we have seen and, since at the same time grit is also removed from the flue gases, additional point is given to the Alkali Inspector's remarks as to unnecessary emissions from non-electrified plants.

Interference with Radio

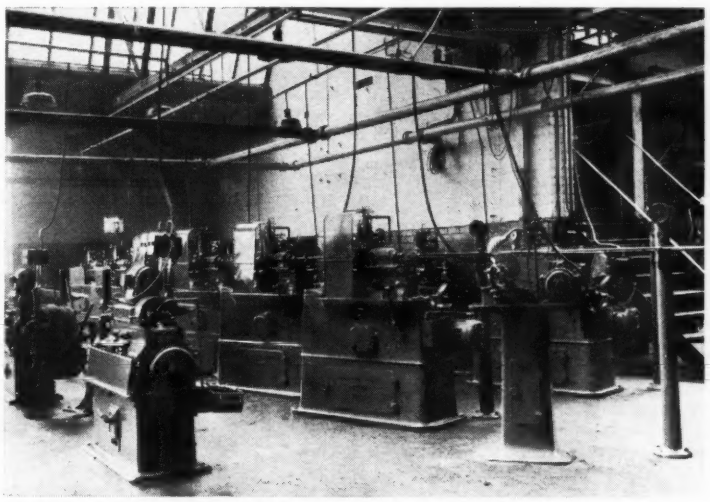
WE would agree with the writer of a letter in this issue that the modern receiver can usually be made interference-free on local British stations. This would, however, generally necessitate the erection of a tall outside aerial with a down lead at some distance from the walls, piping and telephone circuits—a condition seldom realisable in practice. The I.E.E. Committee recommended the issue of regulations covering existing electrical apparatus only if the interference could not be more easily eliminated by *reasonable* alteration of the receiving apparatus.

Extensive Individual Driving

Interchangeability and shop reorganisation to suit varied production rates in a factory for the precision production of specialised parts, are facilitated by a standardised system of machine isolation

ONE of the finest installations of individual machine driving we have seen is that at the works at Birmingham of Hardy, Spicer & Co., Ltd., where about 900 machine tools, each self-contained with its own single- or multiple-motor drive, are employed in the precision manufacture of such specialised products as universal joints, flexible couplings and propeller shafts.

Of particular interest is the fact that individual driving was adopted in the project stages of the enterprise as the result of a definite production policy of the company. In support of this policy Mr. W. E. Sparrow, director, told us how, with individual driving, it was possible to increase the production of a section or line of machines quickly and in a simple manner. A new machine can be introduced to the line in an evening. Sometimes the reorganisation of a complete section of the shop is called for and this can be done without loss of production time. Further, there is occasionally an out-of-balance in production, in which case a single machine representing the "lag" can be run alone until it catches up with production, and the losses associated with the running of a whole system of shafting of a group drive are thereby eliminated. The better lighting afforded by the elimination of belts and the lower accident risk in the absence of ladder work in connection with group drives are other points which influenced the company in determining its policy.



Peterman automatic machines showing flexible "drops" to local isolators on machines *[Elec. Rev. photo.*

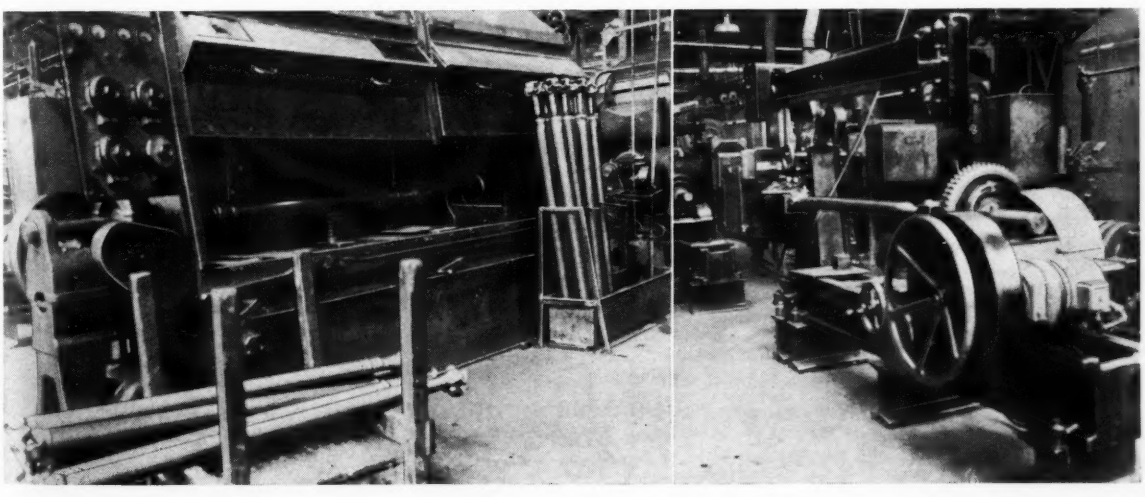
The motors are all comparatively small. They vary in size up to 15 h.p. and the bulk of them are not more than 5 h.p. They represent a maximum load of about 1,000 kVA. Most of them are squirrel cage units, produced mainly by Higgs Motors, Ltd., with push-button automatic control operating in conjunction with small contactor gear, the bulk of which is of Allen West manufacture. Where hand control is employed in a few cases star-delta starters are used. There are also a few single-spindle machines with B.T.H. speed-change motors in which the speed variation is effected by cutting in or out some of the winding.

The success of the scheme whereby the individual drive permits increased production and so on, depends largely upon a standardised system of machine isolation which often renders any interchange merely a matter of minutes. Throughout the whole works every machine can be isolated locally.

From the overhead wiring there is a flexible "drop" to each machine carrying standard metallic connectors which will fit into any isolator on any machine. Standardisation of wiring is also an essential part of the scheme and the machine circuits all consist of 3/.036 sq. in. v.i.r. wire in steel tubing. For the flexible "drops" 3/.036 sq. in. v.i.r. wire is employed. Each metal drop also carries a heavy-gauge copper earth wire which is connected electrically to the isolator on the machine at one end and to the fixed metal tube overhead. When a machine is moved its electrical circuit is isolated at the sub-distribution fuse board in the works. These sub-distribution boards are fixed to the roof girder work and each way serves separately a single machine circuit complete with its flexible "drop." Each board carries its own individual identification sign painted over the whole length of the cover so that it is easily visible at a considerable distance.

Such an extensive scheme of individual driving must, of course, have unfavourable repercussions on the installation power factor, but with today's efficient means of power factor correction this is considered relatively unimportant and the additional capital cost involved in adequate correction is deemed well worth the while. Up to the moment local power factor correction has been depended on entirely by the installation, as near as possible to the motors, of small condensers connected directly across the bus-bars of the individual sub-distribution boards. In the main, this method of local correction is still favoured because, although it is more expensive in the first place, it affords closer correction in respect of the loads for which the condensers are designed. Whereas the overall works load is rather widely variable, the works section loadings are fairly constant.

Mr. S. W. Ramsey, the works electrical engineer, said that the scheme was the nearest practical approach to the ideal one of a separate condenser for each motor. A power factor of 0.8 is obtained by local correction in this way. All the same, recent improvements in power-factor correction equipment have brought about a compromise to some extent in the ideas of bulk and local correction, and the company is now installing four 200-kVA condensers to be connected across the

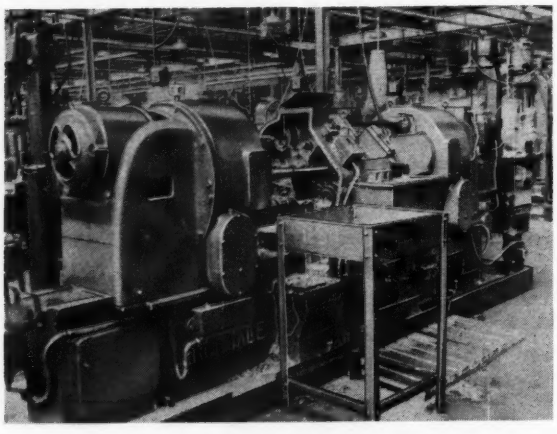


[Elec. Rev. photos.

Left: Front view of automatic arc-welding machine—work cabinet open Right: Torsion testing machine; feed motor front.

low-voltage bus-bars in the main distribution room. It is hoped by this means to improve the installation power factor to about 0.9.

The sub-distribution boards throughout the works are supplied from main "Botrade" fuse boards in the sub-station.

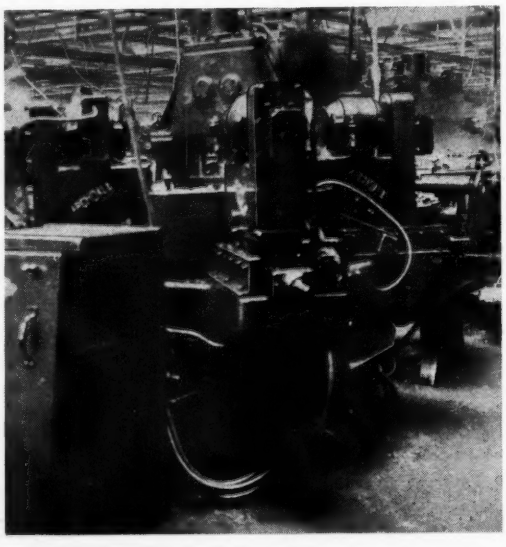


Horizontal boring machines [*Elec. Rev. photo.*

These main boards vary in size from four-way to eight-way, but the fuses are standard throughout at 100 A. English Electric cartridge fuses are employed, and Mr. Ramsey said that they provided protection up to 25,000-kVA rupturing capacity on all circuits. Each main fuse board is served separately by one of a number of Ellison oil circuit-breakers, which are made up as a main feeder switchboard with a sectionalising switch as a bus-bar coupler.

This main switchboard receives its 400 V three-phase supply from four 300-kVA G.E.C. transformers which are served on the high-voltage side by the time-limit fused breakers of a cubicle switchboard, which, in turn, is fed *via* main isolator switches from the 11-kV incoming ring-main supply. Normally, the transformers run in two banks of two equipments, but they can be coupled in parallel.

On each low-voltage phase winding of each transformer is a tapping and the three phase connections and a neutral tapping are brought out separately to give three 110-V phase-to-neutral circuits for the works lighting. Each lighting circuit is carried to an oil circuit-breaker equipped with a separate ammeter on each phase to facilitate load balancing.



Good example of flexible connections on four-way drilling and centring machine [*Elec. Rev. photo.*

The main distribution for lighting supplies is through d.p. switch-fuses which serve distribution boards throughout the works. The general works lighting is afforded by "Maxlume" dispersive reflectors secured immediately to the underside of the roof girder trussings. The reflectors, at ten-foot spacings, are equipped with 200-W lamps. An excellent main earthing system is in vogue, 1½ in. copper plate bridging all the main low-voltage equipment back to a water main.

The following notes relate to a few of the machine tools of special electrical interest which we saw during our tour. On a four-way drilling machine which produces four-way journal trunnions, drilling the centre holes and then countersinking the holes, all the operator need concern himself about electrically is the right moment to "press the button." This brings the four drilling heads into operation simultaneously and the sequence of operations is fully automatic from start to finish. The four 1-h.p. head motors run at 1,400 r.p.m. and are geared down to afford spindle (drill) speeds of about 350 r.p.m. They are all controlled by Igranic control gear on a separate panel in which forward and reverse contactors are arranged to give the correct sequence of operations under the control of limit switches. The push-button puts in circuit the forward contactor, and when the head has finished its forward run the "stroke" is returned to the normal position by the operation of a limit switch on the head.

On a Cleveland hobbing machine which cuts splines in shafts the cutting gears revolve about normally to the revolving shaft. There are two motors—hobbing feed and rapid traverse. Operation of the push button runs up the rapid traverse motor which brings the work (shaft) up to the point of the hobbing tool. The tool is then set in motion by the hobbing feed motor by the operation of a limit switch and having gone through its sequence of operations, it is returned to the normal starting position by the rapid traverse motor.

A horizontal machine for boring trunnion holes has two 3-h.p. rapid traverse motors, two 8-h.p. main spindle and feed motors (each serving two spindles) and two ½-h.p. suds pump motors. The start button operates a rapid traverse motor at each end of the machine. At the end of the traverse motion a limit switch cuts out the traverse motor and introduces the feed. At the conclusion of the normal sequence of drilling operations another limit switch reverses the traverse motor, bringing the head back on rapid traverse to the normal "start" position. An emergency push button can provide complete isolation of the machine.

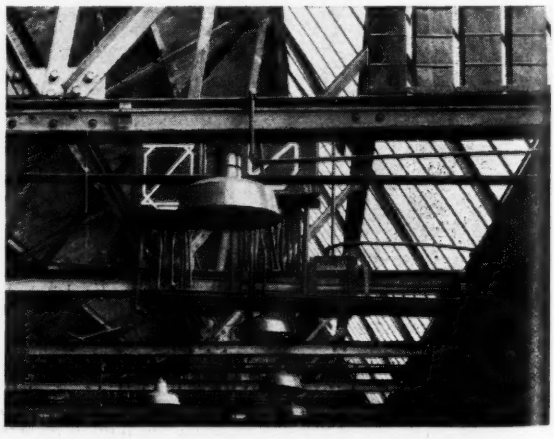
The Igranic contactor gear is totally concealed within the body of the machine. Because of the "moving drives" all the external connection on this machne is by flexible wiring, and air-vane lag plugging switches play an important part in the electrical "make-up." The operations of two-spindle drills are similar to those of the horizontal boring machines, except for the vertical instead of horizontal motions. There are two motors apart from the suds pump units.

Automatic arc welding machines are used for welding tubular shafts. The machine is double-ended, two welds being produced simultaneously, and 300-A d.c. motor generator sets supply the welding current at each end. Automatic feed heads deliver the electrode to the work, and when the arc is struck it continues uninterruptedly to the finish of the weld, when it is broken by a stop button.

The welding voltage is 30 V, at 200 A, and the arc is stabilised automatically by means of reactors mounted on the main generator and in series with the welding circuits. Separate 60-V controlling supplies are provided by ½-kW m.g. sets. The speed of the feed wire is controlled by rheostats, and meters give the operator instant warning of any fluctuation in the arc. The work is totally enclosed in a metal cabinet during operations.

For the testing of joints and couplings, there is a torsion machine in which a motor exerts a "twist" on the work against the predetermined load on the horizontal beam. Consequent on the operation of a push button the motor continues to exert the torsion load until the beam is lifted to the point of balance when a limit switch disconnects the motor. The load is then taken off the beam which thus rises and operates a second limit switch which reverses the motor until it is back to the normal position.

We are indebted to Mr. Sparrow for permission to view the works and take photographs, and to Mr. C. Rollason, production manager, and Mr. Ramsey for their assistance.



Group of local power factor correction condensers and sub-distribution fuse boards in roof structure [*Elec. Rev. photo.*

Southern Extension

Improved services to Sussex coast resorts

ON Monday last the Southern Railway put into regular operation a further 75 miles of electrified route and at the same time considerably augmented the services between London and the towns brought into the "Southern Electric" system. The extension also electrically links the coast towns from Brighton to Portsmouth. Some idea of the extent of the increase in the number of trains can be gained from the following table:—

Weekday Summer Services Between	Former Steam.		New Electric.	
	No. of services.	No. of through services.	No. of services.	No. of through services
London and Littlehampton ...	27	1	42	18
London and Bognor Regis ...	19	8	19	16
Brighton and Littlehampton ...	34	1	38	18
Brighton and Bognor Regis ...	28	1	51	17
Brighton and Chichester	22	17	38	36
Brighton and Portsmouth ...	19	15	35	33

The lines are those comprised in the "Portsmouth No. 2" scheme and as will be seen from the accompanying map (which is not strictly to scale) start from Dorking North and Three Bridges and run through Arundel to a number of coast resorts.

The power for the new services and the distribution system has been designed to link up with existing supplies, with the addition of a new supply from Leatherhead and Three Bridges Central Electricity Board sub-stations. There are four feeding points—Wymering, Fishergate, Three Bridges and Leatherhead. Altogether, twenty new sub-stations and twenty paralleling huts have been built, of similar pattern to those built for the other electrified main lines to the South Coast. Seventy-seven miles of three-phase 33-kV cable have been laid along the line. The control room is at Havant.

Resignalling was necessary for this scheme; in particular new signal boxes have been constructed at Dorking North, Horsham, Arundel and Bognor Regis. Colour-light signalling has been installed at Dorking North, Horsham and Havant, and intermediate section colour-light signals at various places.

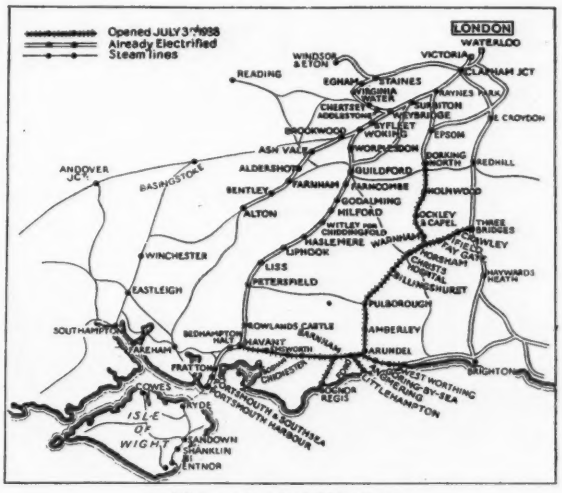
Over 100 telephones have been installed at stations and sub-stations, for communication with the electrical control rooms; and 85 telephones have been provided for traffic purposes.

This scheme has involved a large amount of engineering work, including the rebuilding of Chichester, Horsham and Littlehampton stations and extensive alterations at Dorking North, Bognor Regis and Arundel.

At Streatham Hill a new car shed is being constructed, to accommodate four 12-coach and four 8-coach trains. This depôt will be provided with a carriage-washing machine. The existing carriage repair shop at Slades Green has been extended to cope with the increased number of electric coaches.

Modern electric coaches (292) have been built for the extensions at the Railway Co.'s shops at Eastleigh and Lancing. They form thirteen 4-coach sets (each including a buffet car); twenty-six 4-coach vestibule sets; and sixty-eight 2-coach motor corridor sets; together providing seating accommodation for over 15,000 passengers. The vehicles generally follow the lines of those put into service on the Waterloo-Portsmouth line last year, except the buffet coaches which are of a new type.

Each of the latter contains a kitchen, a bar section, a saloon section and two lavatories. A new feature of these and the other stock is the substitution of swing doors for the sliding type in the corridors.



The newly electrified lines

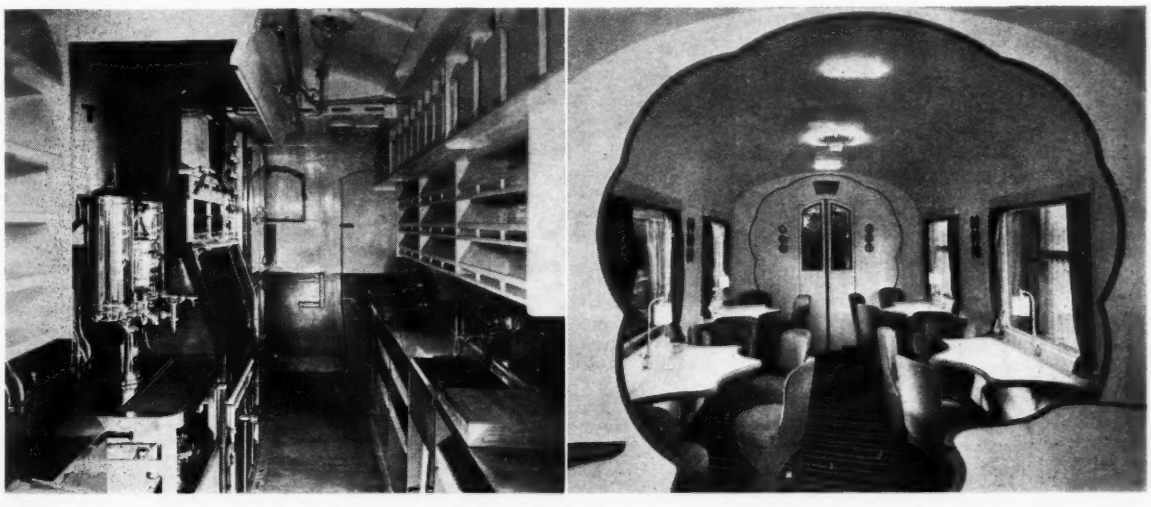
The kitchen equipment is electric, the plant consisting of a cooking range with four boiling plates, two grills, one roasting oven and a hot press for plates. There are also provided a boiler, coffee-making machine and milk boiler. Part of the supply for cooking is taken from the 660-V traction supply, for the boiler and roasting oven, and the remainder from the low-voltage side of a 660/70-V motor generator, for the grills and hot plates. In addition there is a 660-V refrigerator.

The lighting is by means of five 1-ft. straight 30 mm. 70-V 60-W tubular lamps manufactured with rounded ends and three complete 22 in. circles comprising four lamps (60 W each), each section having rounded ends. The type of lamp used is the Union architectural traction lamp which is fitted with a special flexible spine to absorb shocks. These lamps are fitted directly into the holders, partly counter-sunk into the ceiling.

Stone's system of pressure ventilation equipment has been fitted and four "Imperiston" porthole exhaust type fans are provided in the roof.

In the two- and four-car trains electric water heaters are installed below the lavatory basins.

The contractors included the following:—Asea Electric, Ltd., h.v. switchgear and supervisory equipment; B.I. Cables, Ltd., l.v. cables, track bonds and inspection shed trolley equipment; British Thomson-Houston Co., Ltd., high-speed circuit breakers; Bruce Peebles & Co., Ltd., mercury-arc rectifiers; Chloride Electrical Storage Co., Ltd., sub-station and control room batteries; English Electric Co., Ltd., traction equipments; Heatrae, Ltd., water heaters; W. T. Henley's Telegraph Works Co., Ltd., multi-core cables; Marco Refrigerators, Ltd., refrigerators for buffet cars; Pritchett & Gold and E.P.S. Co., Ltd., emergency lighting batteries; Siemens Electric Lamps & Supplies, Ltd., lamps; W. M. Still & Sons, Ltd., and J. Stone & Co., Ltd., kitchen equipment; Taylor, Tunnicliff & Co., Ltd., rail insulators; Union Lamp & Lighting Co., Ltd., architectural lamps for buffet cars; Westinghouse Brake Co., Ltd., motor-driven air compressors.

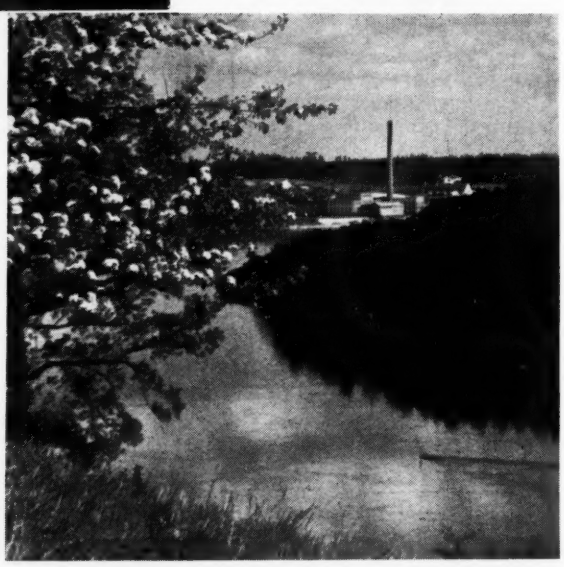


The kitchen and saloon of one of the new buffet cars

Electricity in Lithuania

By a Correspondent

SINCE it gained its independence the small Baltic State of Lithuania, which has a population of only 2½ millions, has been carrying out as extensive a system of reconstruction as possible within its financial limits. Although the country is mainly dependent upon dairy exports, the manufacturing side is now being developed, while the amenities of modern civilisation are being gradually introduced. Dairying itself is undergoing extensive modernisation, so that exports, the bulk of which come to Britain, shall secure as high a price as those of Denmark.



Left: Kaunas, the temporary capital of Lithuania. Below: Hydro-electric station on the River Niemen

In this social and industrial revolution electrification has begun to play an important part. Two sources of power are available, water and peat bog. Under the Ministry of Communications, careful surveys have been made of the areas containing these power sources. Sixty thousand hectares of peat bog are owned and controlled by the State, and of this two-thirds have been surveyed. As investigation proceeds, however, new areas are discovered.

In 1936 65,000 tons of peat were dug. Bogs are leased to industry, which is charged from 30 to 70 cents a square metre for digging, and the largest of the bogs are leased by important municipalities for power supply. One, near Lake Rekyva, is utilised for an electro-thermal station at Siaulai, and another near Radviliskis, with an area of 585 hectares, is being exploited this summer. From this it is proposed to dig and prepare 30,000 tons of dry peat annually to be used in power plant for supplying electricity to a big sugar factory and other undertakings in the vicinity.

Hydro-electric Proposals

In order to set up a chain of power stations throughout the country, over a period of four years, there has recently been formed the Lithuanian Electrification Joint-Stock Company, with a capital of 6 million litas (26 litas to the £). Of the 100,000 shares, 51,000 are held by the State. Hydro-electric development will be the new company's main task.

As a beginning, two hydro-electric stations, intended to provide electricity for lighting only, with a combined power of 2,000 kW, will be set up near Siauliai at a cost of 2,800,000 litas. At the same time, the present Siauliai station, which is worn out and cannot supply the required demand, is being replaced by a new 4,000-5,000-kW thermal station deriving its energy from the Rekyva peat bog. Operation of the latter is expected to begin next year.

Following these small installations, work will begin either in 1940 or before on a large water-power plant on the River Neris, near Jonava, linking up with new hydro-electric plants at Rekyva and Minija. A further large hydraulic plant will be built on the River Nemundas.

The 1935 electricity output in Lithuania was only 32.2 million kWh, but even this was an advance of over 10 million kWh on 1930. Hitherto, foreign capital has been mainly responsible for electricity generation, Belgian investors holding stock valued 16,235,000 litas out of a total of 18,400,000 litas. Now, however, the country aims at financial independence.

In the last two decades industrial undertakings have doubled in number to 1,135, employing over 30,000 workers. Up-to-date factories with a substantial electricity consumption have been set up for the manufacture of textiles, metals, leather, sugar, paper, cellulose, chemicals, rubber, alcohol, matches, bricks, confectionery, glass, and other commodities. Electricity is also required by agriculture for sinking artesian wells, for the storage of exported butter, eggs and bacon, and for the nation-wide chain of hygienic, up-to-date dairies. In addition, 7,400 new electrified buildings have been erected in the capital alone during the last ten years. In 1926 only six railway stations were electrically illuminated, but this number has increased to thirty-eight, the railways having their own network of eight supply stations which produce one million kWh annually.

One of the recent important electrical enterprises was the modernisation of the telephone system, automatic exchanges being installed in the largest cities by the Automatic Telephone and Electric Co. An international survey was made by a Commission and the system of the British Post Office was considered the most suitable. An equipment capable of housing 20,000 lines, but at the moment adapted for 7,500 lines, was laid down at Kaunas in 1936, the former overhead lines being replaced by underground cables, while a 500-metre cable was laid across the River Niemen to link up with the suburbs.

The same year saw another important electrical undertaking in the erection of the new 9.5-kW radio station near Klaipeda, for which a 6,000-metre high-voltage underground cable was laid, bringing electricity from the city to the transmitter. Twenty miles from Kaunas is the site of the powerful new 60-120-kW radio station, which will cost 2½ million litas when finished. When the first broadcasting station was opened in 1928 there were seven licence holders; now there are 40,000.

In order to secure still closer trade links with Britain, the Lithuanian Government has intimated its country's desire to purchase manufactured goods from us, and delegations from Lithuania and British Chambers of Commerce have made reciprocal visits. It would seem that Lithuania is a market for many varieties of manufacturers' or consumers' goods produced in our own country.

Power Station Visit

At the invitation of the Galloway Water Power Co., delegates attending the International Engineering Congress at the Empire Exhibition, Glasgow, on June 23rd, inspected the various power stations. Among the visitors were Mr. L. Rothera, chief electrical engineer to Messrs. Colville, Sir Leonard Pearce, engineer-in-chief, London Power Co.; Mr. A. Pollitt, chief constructional engineer, London Power Co.; and Mr. W. Sutcliffe, manager for Scotland, English Electric Co. The party was received at Dumfries by Mr. F. H. Williams, general manager of the Galloway Co., and Mrs. Williams, and Mr. T. Lawrie, the secretary. After inspecting the dam and the power station at Tongland the visitors were entertained to luncheon by the company at Kirkcudbright. Mr. Williams, who presided, said that the Galloway scheme was capable of producing about 200 million kWh a year.

Engineering Design

By J. O. Knowles, M.A., A.M.I.E.E.

Examples of suitability combined with elegance from switchcase construction

A design should be both fitted to the task and of attractive appearance. Elegance should not, however, be an afterthought or blind obedience to a fashion. It should be the hall-mark of an experienced designer, who is so familiar with the characteristics of his material that the design looks right because it is right

EIGHTY years ago a railway engineer speaking of the design of railway tunnels said: "They should be massive to be suitable as approaches to works of gloom, solidity and strength. It is plainness that in a tunnel entrance constitutes elegance." Functionalism and romanticism are not mixed in such nice proportions these days, when even in domestic architecture the ideal room is considered to be a glass-sided tank. It has been said with lucid, cold engineering logic untouched with humanism that "Utility is the basis of beauty." Plainness has indeed constituted elegance.

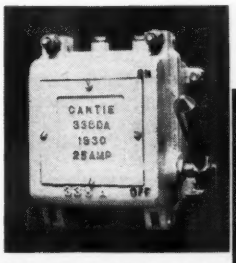


Fig. 1.—Cast-iron case with "stuck-on" projections

Should there not, however, be a fair balance between functionalism and elegance in the finish of engineering products? One might expect elegance in such products as cookers and refrigerators sold to the domestic consumer, though the fashion is for a smooth and not what our grandfathers would have called an elegant finish. On the other hand, functionalism might be expected in engineering products sold by engineers to engineers, whereas these gentlemen are often very particular about the superficial appearance of the plant they buy. The proud scroll-work that used to support the clock over the old style of open-type switchboard was once a symbol of "finish." Nowadays, the scroll-work has gone, but chromium plating has taken its place.

The following simple instances from switchcase construction show how appearance is affected by the materials and processes of manufactures. The designer of ironclad switchgear should, for instance, be guided by a consideration of whether a case is to be of cast iron or of sheet steel. Cast iron is poured into a mould and shaped from a pattern. Sheet steel is bent and welded. The two methods are not interchangeable, but it is surprising how often draughtsmen fail to distinguish between them.

A switch box designed some years ago for manufacture in cast iron is shown in fig. 1. The two halves of the box are of equal depth to give a shallow draw out of the mould. The base fixing lugs are loose pieces in the pattern and, in fact, all the lugs look what they are—pieces stuck on. After all, this is how the pattern maker makes the pattern. He makes the box shell first and puts the trimmings on afterwards.

Fig. 2 shows a switch box of similar but later type, the design of which has been affected by a desire for elegance. This box is less functional in design. The pattern is far more expensive than that of the previous box, and the idea underlying the design is obviously not that of making a simple pattern, but of using the full resources of the pattern-maker's art for the purpose of producing a "good-looking" box of "clean" appearance—almost streamlined.

Fig. 2.—An approach to elegance

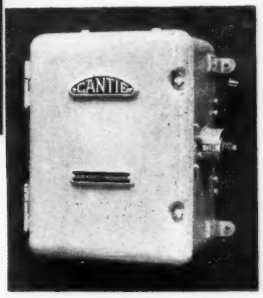


Fig. 3.—Clean design in sheet steel

In fig. 3 is shown a switch box designed for production in sheet steel. The box is no longer in two equal halves. The lid is shallow and designed so that it can be easily pressed from steel sheet. The base portion is deep and intended as a wrapping to form the sides, welded to a sheet forming the bottom. The base fixing lugs are shaped and bent from steel strip, while the hinges of the lid are tubes welded on and the lid is fastened, not by external lugs, added on as in the cast-iron designs, but by bolts bedding on facings pressed in the lid and by tubular hinges. The smooth appearance and clean lines of the design of the case are functional rather than elegant in origin, corresponding to the smooth quality of the sheet steel from which the box is made. In cast-iron construction it is functional to have knobs, patches and ribs. They are produced naturally in the building up of the pattern, but in sheet-steel construction, ease in bending and pressing with a minimum of pieces welded on determines the lines of

Fig. 4.—Pure functionalism

Fig. 5.—A modern sheet-steel board

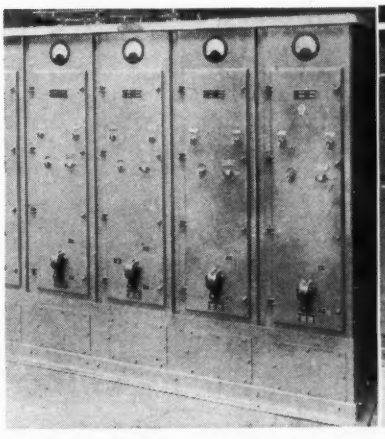


Fig. 6.—Mixed functional styles

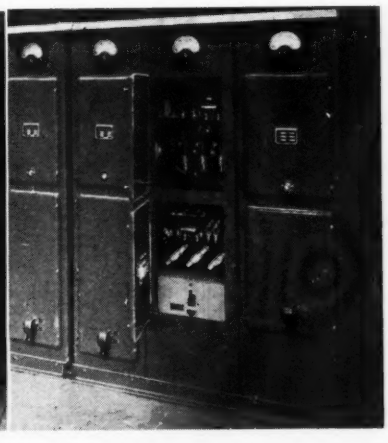


Fig. 7.—An example of consistency

the design. A combination of sheet-steel and cast-iron construction is illustrated in fig. 4. This was made some years ago in a shop where welding plant was not available. The switch boxes and the ammeter boxes are of cast iron and the angle framework is bolted together. The point of interest is the bus-bar chamber running horizontally across the middle of the board. At each joint in the horizontal length of the bus-bar chamber, there is a light cast frame to which the ends of the sheet-steel wrappings forming the bus-bar chambers are fixed by screws. The large plane surfaces are of sheet steel, and the complex fittings forming the joints are of cast iron, with ribs against which the sheet steel registers, with bosses for screw holes and brackets to support the bus-bar insulation.

Each material is used for that function for which it is best suited. The lids covering the bus-bar chamber are cast-iron frames filled in with sheet steel. It is difficult to cast a large and light plate in cast iron, especially if the edge must be thickened to take a packing groove. It is easier to cast a narrow frame with ribs to assist the flow of metal and to fill in the centre of the frame afterwards. The bosses holding the lid are also projections on the pattern, again with strengthening ribs, typical of cast-iron practice, since cast iron breaks easily under torsion and does not bend like sheet steel.

Nevertheless, the whole appearance of the board is out of date in spite of its functionalism. Fig. 5 is a much more modern example, built entirely of sheet steel with welded framework. It must not, however, be considered modern solely because it is of sheet steel. It is modern because it conforms to modern ideas of elegance. Its appearance suggests cleanliness, with a minimum of dust-collecting ledges.

Aeroplanes, cars and high-speed trains are streamlined because this is functional in such structures. The demand for flush construction in switchboards is only functional if this construction is economical in material and labour. At the same time, an elegant effect is not entirely useless if it induces better maintenance through pride in the installation.

It is indeed a real difficulty which faces manufacturers of auxiliary apparatus (such as motor-control gear) to secure for their products after manufacture a measure of that care and attention which is given during manufacture. For example, an instrument manufacturer produces an accurate and necessarily delicate instrument but often its accuracy is destroyed even before installation by careless handling. The superior finish given to the cases of instruments of precision is an appeal to the user's respect for elegance.

A power station boiler-house installation is also expensive, but until recently many such installations were maintained in a condition which was functional rather than elegant. The function of a boiler is to burn coal. Coal is dirty and so were many boiler-houses. Spotless turbine rooms were seen next door to badly lighted, unnecessary dirty boiler rooms. Is it an elegant or a functional tendency that has brought about the vogue for well-lighted aluminium painted boiler rooms?

Perhaps it is the increase in the lighting points allocated to boiler-rooms which has brought into view the auxiliary switchgear and motor-control gear which used to be tucked away in dark alleys and corners where maintenance was only possible with a hand-lamp.

An early example, now some fifteen years old, of the grouping of the starters for boiler-house auxiliary motors is given in fig. 8. It is true that these starters look like a row of penny-in-the-slot machines and that the boiler instrument panels are primitive, but the functional idea associated with this layout is that of centralised control. Fig. 9 shows a later example of boiler-house control gear in which the cases are made of uniform height, this being economically possible because the fabricated construction of the cases and doors does not limit the dimensions as the existence of standard patterns limits the sizes of cast doors. A present-day example of the fabricated construction shown in the previous illustration appears in fig. 10. This board has the appearance of an established design instead of the tentative and experimental appearance of the previous examples. In other words, the functional and the elegant have been successfully married.

The question of the establishment of a design is allied to that of securing a unity in design. Referring to fig. 6 as an early example of starter switchboards, notice the nameplates. On the upper row are cast nameplates with raised letters. Those in the next two rows are engraved, the letters being cut on aluminium alloy, except for the curved plates (which do not match any of the others in shape). The "On" and "Off" nameplates below have etched white letters on a black background. The method of manufacturing each nameplate is functionally correct for the material used, but the juxtaposition of three different styles is inelegant. Fig. 7 shows a later and more consistent example.

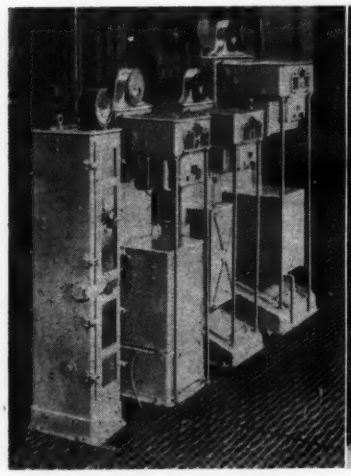


Fig. 8.—Elementary centralised control

Fig. 9.—An effort to secure uniformity

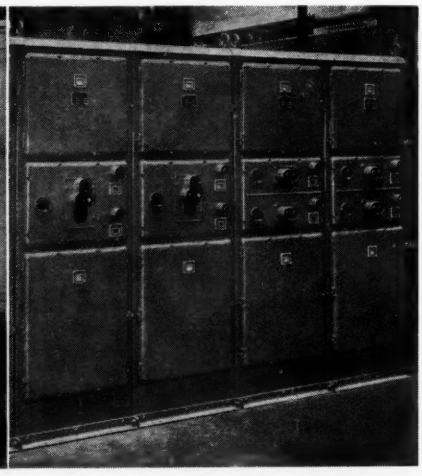


Fig. 10.—The functional and elegant achieved

Electricity and the Brain

THE use of electricity to train a disordered brain so that its impulses return to the regular mental pathways was suggested at a recent meeting of the American Psychiatric Association, at San Francisco. This new use for electricity has shown its possibilities in experiments on 157 epileptic persons conducted by Dr. Wilder Penfield and Mr. Edwin Boldrey, of McGill University. The brain current, in a series of electrical waves representing potentials of a few millionths of a volt each, flows from a normal brain at the rate of about ten waves a second. From the brains of epileptics the electrical "pulse" is slower and more irregular, and this is most pronounced in one locality in the brain, which can be found by placing small pick-up electrodes on the head and amplifying the "pulses" flowing into them. The McGill physicians located the seat of the epileptics' "brain waves." Then they applied a small electric stimulating current to the part of the head nearest the epileptic centre causing mild attacks of epilepsy. They were not enough to cause unconsciousness and the patients were able to give the doctors intelligent descriptions of their feelings. In this way it was learned that epilepsy was partly a matter of the brain getting into "bad habits" in passing messages to or from the nerves. The effect of electrical stimulations suggested new possibilities of treatment.

A study of electrical "brain waves" showing that the principal form of insanity, schizophrenia, was electrically similar to epilepsy was reported by Dr. Herbert H. Jasper and Dr. Charles P. Fitzpatrick, of Providence, R.I., and Dr. Philip Solomon, of Boston. The encephalograph is an instrument which shows that all brains beat in a regular pulse of rising and falling electric potential that changes in mental disorder. It becomes either too fast or too slow, and new methods of reading this "pulse" so as to recognise the onset of mental disorders before they are apparent even to a doctor have been worked out by Dr. Frederick A. Gibbs, Mrs. Emma L. Gibbs and Dr. William G. Lennox, of Harvard Medical School, Boston. They said that this pulse beat of sanity can be thrown out of gear by the use of drugs, and also that the abnormal beat of a disordered mind can be improved by chemicals. In this way of finding chemicals to affect the mind, they reported, there is a new field of mental treatment.

The Cyclotron. By T. F. Wall, D.Sc.

Principle of operation and practical significance

With this remarkable apparatus all the elements in the periodic system can be transmuted and many difficulties and complications involved in the use of very high voltages for this purpose are eliminated

IN 1919 Rutherford discovered that when a high velocity alpha ray, that is, a ray of positively charged helium atoms, passes through certain substances, it may enter the nucleus of the atom, causing it to disintegrate and emit a proton, that is, a hydrogen nucleus.

In 1929 Cockcroft and Walton commenced the construction of apparatus for accelerating protons, capable of providing a potential difference of about 900,000 V for the purpose of obtaining high-speed particles as a means for transmuting the elements. As a result of this work it was found to be possible to obtain protons of sufficient energy to bombard and transmute the nuclei of atoms of low nucleus charge, that is, of low atomic number. In this way the transmutation of elements of atomic number up to about sodium could be realised when the potential difference of the accelerating electric field was about one million volts.

The cyclotron is an appliance developed by Prof. E. C. Lawrence, of the University of California, by means of which all the elements in the periodic system can be transmuted and all the difficulties and complications involved in the use of very high voltages for this purpose are eliminated. In the cyclotron the comparatively low pressure of 10,000 to 20,000 V are used and the same energy is imparted to the protons, by the application of successive impulses, as is obtained when the very high-voltage electric fields are alone used. It is claimed for the cyclotron that the requisite apparatus is much smaller, cheaper, and more reliable than the method which requires extremely high voltages alone.

The existence of fragments of atoms can be demonstrated by means of the Wilson cloud chamber and the cloud tracks formed by them provides proof that atoms and their component parts are real objects which can be experimentally examined individually.

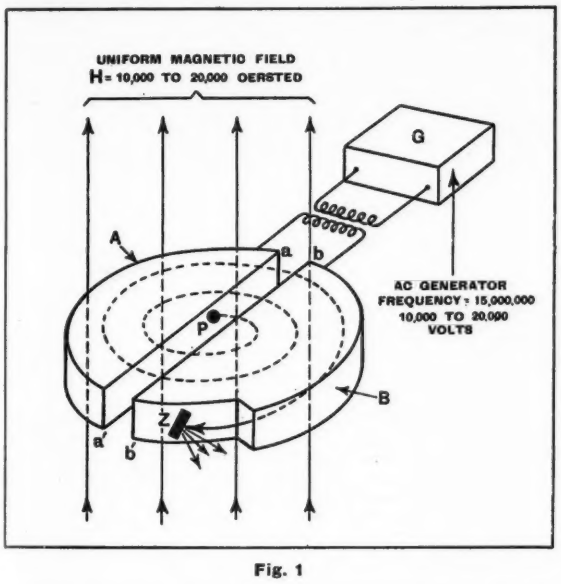


Fig. 1

If a particle of mass m is moving at a speed v, the kinetic energy will be $\frac{1}{2}\ m.v^2$. If the particle has an electric charge e and the velocity v is acquired by allowing it to fall through a potential difference V in an electric field, the acquired kinetic energy will be $V.e$, so that, expressed in appropriate units, $V.e=\frac{1}{2}m.v^2$. When the potential difference V is expressed in volts it is termed the "energy in equivalent volts" of the moving particle.

Constructional Features

The constructional features of the cyclotron may be understood by reference to the diagrammatical sketch shown in fig. 1. Two D-shaped hollow semi-circular copper castings A and B, about 28 in. in diameter, are separated by a gap $aa'\ bb'$. At P is fixed a spiral filament which is heated electrically. Across the gap between the two D-shaped casings is connected a high frequency generator G so that an alternating electric field is established in this gap. The casings are arranged in a vacuum chamber containing hydrogen gas at a pressure of from 1/1,000 to 1/10,000 mm. on the mercury pressure gauge.

The heated spiral P emits electrons and the hydrogen gas in the vacuum chamber is in this way dissociated. The protons, that is, the hydrogen nuclei, are accelerated by the electric field which exists across the gap $aa'\ bb'$. The action of the magnetic field shown in fig. 1 is to cause the protons to move in a circular orbit of constant angular velocity, the speed being such that the protons travel a complete circle in the time required for the electric field in the gap $aa'\ bb'$ to pass through one complete cycle. Exact synchronism between the angular velocity of the rotating protons and the frequency of the generator G is essential for the satisfactory operation of the cyclotron. If heavy hydrogen is used in the vacuum chamber the charged particles will be deutrons.

When exact synchronism is obtained the protons will always cross the gap $aa'\ bb'$ when the electric field is in the same direction and consequently each time a proton reaches the gap it is accelerated by a definite amount. The radius of its orbit will then increase a corresponding amount but its angular velocity will remain constant. The protons may in this way travel from 50 to 400 times round the inside of the D-shaped casings before emerging to strike the target Z, which is formed of the substance which it is desired to transmute.

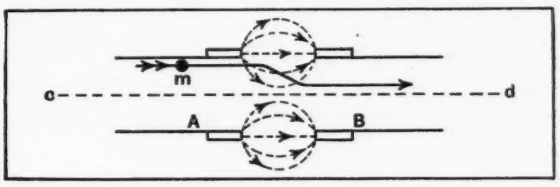


Fig. 2

If the protons tend to diverge from the central plane of the casings A and B during their journey round their orbit, the electric field which crosses the gap will guide them back towards the central plane, as will be seen by reference to fig. 2.

Theory of Operation

The fundamental data by means of which the energy which is imparted to the protons may be calculated will now be considered. If a particle of mass m and charge $-e$ is moving with a velocity v in a plane at right angles to a uniform magnetic field of intensity H, the force F acting on the particle will be at right angles to H and also at right angles to the direction of the velocity v as shown in fig. 3. The magnitude of the force will then be $F=H.e.v$.

The particle will be accelerated in the direction of F and this denotes that it moves in a circle of radius r (fig. 4) where $F=H.e.v.=\ m\ \frac{v^2}{r}$

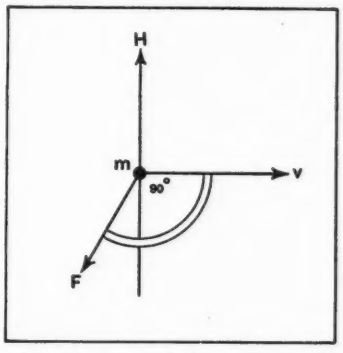


Fig. 3

i.e., $v\ =\ \frac{H.e.r}{m}$ The particle will revolve at a speed n r.p.s. where $v=2\pi rn$ and the time of one revolution will then be $T=\frac{1}{n}=2\pi m/H.e.$ That is to say, the *time of one revolution is independent of the velocity v.* Any increase of the velocity v will produce a proportional increase of the radius of the circular orbit so that the angular velocity remains unchanged.

The kinetic energy of the particle will be

$$u=\tfrac{1}{2}mv^2=\tfrac{1}{2}\,(H.e.r)^2/_m \text{ ergs,}$$

for m in gm. and v in cm. per sec.

If the charge of the particle is e electrostatic units and if it is moving at a speed of v cm. p.s., the equivalent current will be $e.v.$ electrostatic units. Now a current of i amperes is

$(3\times10^9).i$ electrostatic units so that a current of $e.v$ electrostatic units is $\frac{e.v.}{3\times10^9}$ amperes.

If the intensity of the uniform magnetic field is H oersted, the force on the moving particle will be $F=\frac{H.e.v}{3.10^1}=m\frac{v^2}{r}$ dynes. The kinetic energy will then be $u=\frac{1}{2}mv^2=\frac{1}{2m}\left(\frac{H.e.r}{3.10^{10}}\right)^2$ ergs and the energy in equivalent volts will be

$$V=\frac{1}{2m}\frac{(H.r.)^2e}{(3.10^{10})^2}\ 300 \text{ volts.}$$

If the moving particle is one *proton*, then, $m=1.66\times10^{-24}$ gm., and the charge $e=4.77\times10^{-10}$ electrostatic units.

If the moving particle is one *deutron* then $m=3.32\times10^{-24}$ gm. and the charge e is the same as for one proton.

Example.—If $H=20{,}000$ oersted; $r=40$ cm.; then $(H.r)^2=0.64\times10^{12}$ and the energy in equivalent volts is $V=30.6\times10^6$ volts for a proton and 15.3×10^6 for a deutron. The energy expressed in mechanical units will be $0.36/10^{11}$ ft.-lb. for one proton.

In the cyclotron a ray of high-velocity protons forming a current of 80μA can be obtained. If N is the equivalent number of charged particles which strike the target per second then $\frac{N.e.}{3.10^9}=\frac{80}{10^6}$: so that $N=50\times10^{13}$.

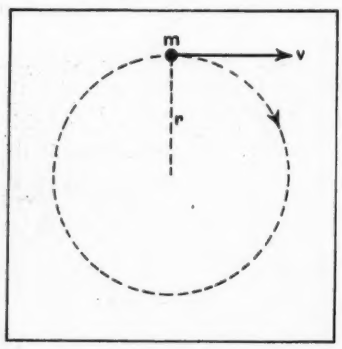


Fig. 4

The total energy of impact on the target Z in fig. 1 will then be $\frac{0.36N}{10^{11}}$ =1,800 ft.-lb. per sec., that is, 3.26 horse-power. If the expression for the energy in equivalent volts is used, the same energy of impact is of course obtained, *viz.*, $v.i.=30.6\times10^6\times\frac{80}{1}{}_6=2{,}450$ watts=3.26 horse-power.

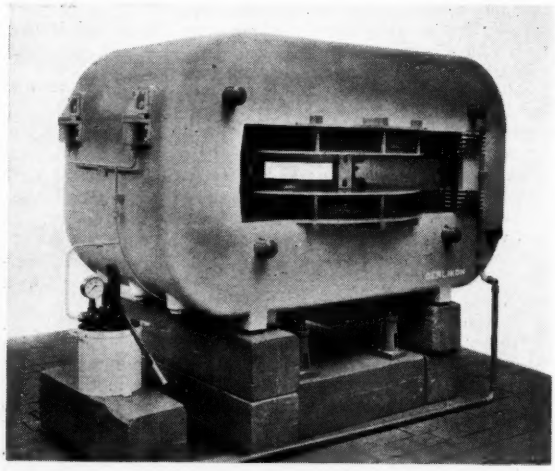
The frequency of the generator G in fig. 1 is $f=15\times10^6$ cycles per second and if the radius of the D-shaped chambers is 40 cm., the speed at which the particles will emerge will then be $v=2\pi.r.f.$ cm. p.s., or 23,500 miles p.s.

Some Practical Details

The uniform magnetic field shown in fig. 1 is obtained by means of an electro-magnet. For the magnet supplied to Prof. Joliot in Paris by the Oerlikon Co. the magnetic intensity is H=20,000 oersted. The cylindrical cores of the magnet have a diameter of 80 cm. and the air-gap is 9 cm. The weight is about 26 tons and the overall dimensions are, approximately, 8½ ft. long, 6 ft. broad, and 4 ft. high. The excitation coil conductors are of copper tube, of which the section is square outside and circular inside, thus giving a high space factor. The necessary cooling is obtained by circulating water through the conductor tubing. The maximum number of ampere turns is 200,000.

The adjustment for synchronism between the frequency of the generator (that is, the frequency of the electric field which crosses the gap aa' bb' figs. 1 and 2), and the angular velocity of the rotating charged particles, is obtained by regulating the exciting current of the magnet. The value of the intensity of the magnetic field for synchronism is very sharply defined and very slight changes, such as temperature variations, may easily affect both the frequency of the generator and the intensity of the magnetic field. It is therefore necessary to obtain continuous control over the magnetic field in order to maintain synchronism. This may be done either by hand regulation, or by means of an automatic regulating device.

An approximate idea of the cost of the standard equipment as supplied by the Oerlikon Co. is as follows:—(i) Laboratory magnet with exciter and control gear, £3,000. (ii) High-frequency generator inclusive of accessories, £4,750. (iii) Accelera-



The Oerlikon electro-magnet

tion chamber with accessories, £400. Vacuum and oil diffusion pumps, £250. Supplementary accessories, £250.

Prof. Lawrence has in operation an equipment of which the magnet weighs about 100 tons, and he now has under construction a new design of installation for which the magnet will weigh about 220 tons. Altogether there are in various parts of the world from 25 to 30 sets either in operation or under construction, of which two are in England, several in the United States, and at least one is being built for Russia.

As already stated, the transmutation of atoms of low atomic number—up to about sodium (atomic number 11)—can be achieved by a beam of protons which have been accelerated in an electric field of potential difference of about one million volts. The cyclotron, however, can produce a proton ray of sufficient energy to transmute all the elements of the periodic system. It is also now possible in this way to build up new and complicated atoms which occupy a place beyond uranium, the heaviest atom in the periodic system, and these new atoms are termed transuranium atoms. Further, the cyclotron can produce a copious supply of neutrons when, for example, a ray of protons is caused to impinge on a target of beryllium.

Perhaps the greatest practical significance of this remarkable achievement of technical skill and scientific research is the means which it affords for the artificial production of radio-active substances which, for many purposes, such as destroying cancer, are expected to provide a relatively cheap and effective substitute for radium.

In a somewhat restricted sense, therefore, the cyclotron is, in fact, the "philosopher's stone" which the alchemists of the Middle Ages sought for with such strange persistence and such astonishing prophetic instinct and which has now been realised on a basis of scientific fact.

International Broadcasting Conference

THE International Broadcasting Union (U.I.R.) has just concluded its summer meeting at Ouchy, Lausanne, under the presidency of Monsieur Antoine Dubois (Director of Nozema, Holland). In the course of the meeting the Greek broadcasting service and the Spanish Republican broadcasting service were elected active members. In addition, the following associate members were elected: the Argentine Government station LRA of Buenos Aires; the broadcasting service of the Department for Press and Propaganda attached to the Mexican Foreign Office and the Mutual Broadcasting System (United States). The broadcasting service of General Franco's administration was admitted as a special member.

It appears from the annual Council report that the number of radio receivers registered (or licences) throughout the world at the end of 1937 was about 87.5 millions, of which 31.2 million sets are in Europe, not including the U.S.S.R.

The meeting had a particular importance owing to the fact that the World Telecommunications Conference, which was held in Cairo last spring, had invited the U.I.R. to draft the basis of a plan for revising the wavelengths for European broadcasting with a view to a conference to be held in Switzerland next year. Accordingly the Technical Committee, under the presidency of Monsieur Raymond Braillard, Director of the Brussels Checking Centre, held preliminary discussions in regard to certain fundamental points of this plan which will be definitely elaborated by the U.I.R. during its Brussels meeting next October.

As regards broadcasting on short waves, the president of the Technical Committee was asked by the Council, following the wish expressed by the Cairo Conference, to draw up a memorandum containing all useful information regarding the present aspect of the question with a view to a possible world conference on short-wave broadcasting.

The U.I.R. Council noted a certain number of improvements in regard to interferences still existing on medium waves. It was decided to continue active collaboration with the International Special Committee against broadcast interference.

The director of the Checking Centre reported on the excellent effect of the transfer of the service to the new building specially built at Brussels, enabling it to increase its efficiency for checking broadcast transmissions on an international basis, a work which it has carried on for the last eleven years.

International Standardisation

Decisions taken at the Torquay meeting

From a Correspondent

Further steps towards the international standardisation of electrical nomenclature, specifications, materials, testing methods, etc., were taken at the Torquay meeting of the I.E.C. The work of the Conference is briefly summarised in these notes

THE 1938 Plenary Meeting of the International Electrotechnical Commission concluded last Friday with a banquet at the Guildhall, London, at which the guest of honour was the Duke of Kent. At this early date it is difficult fully to assess the significance of the work accomplished by the I.E.C. during the nine-day meeting in Torquay, but the general impression is that it has been one of the most successful Plenary Meetings ever held. The number of delegates was a record, there being about 350, and in addition about 100 ladies. Twenty-two countries were represented, the largest delegations being from Great Britain (92), Germany (70), Italy (36), France (27) and the United States (22).

The Plenary Meeting proper opened at the Town Hall on Wednesday, June 22nd, when a message from the Duke of Kent was read, and speeches of welcome were made by the Mayor of Torquay (Alderman the Rev. Isaac Pugh, J.P.), Sir Cyril Hurcomb (on behalf of the British Government), and Mr. Roger T. Smith (chairman, British National Committee), to which Mr. James Burke (U.S.A.), president, I.E.C., responded. The delegates then proceeded to the meetings of the Advisory Committees, which continued until the following Wednesday (terminating with a final Plenary Meeting at the Town Hall at 6 p.m.), with a break on the Sunday for a drive across Dartmoor, the party stopping at Dartmeet and Buckfast Abbey.

During the week a number of social functions were held, including a civic reception and ball on June 22nd, given by the Mayor in the Marine Spa, and a civic garden party at Torre Abbey on the Saturday afternoon. On Saturday evening a programme of 16th and 17th century English madrigals was rendered by the English Singers.

On Monday, June 27th, the British National Committee entertained the delegates to luncheon, and its chairman thanked the Mayor and Corporation for placing the Town Hall and committee rooms at the disposal of the I.E.C., and Mr. G. J. Hollyer, the borough electrical engineer, for allowing the use of the Electric Hall as a general office.

On Wednesday evening, June 29th, the new President, Professor L. Lombardi (Italy) held a reception at the Marine Spa, and during the evening accordion and harmonica recitals were given by Professor Niebuhr (Argentina) and Mr. S. Norberg (Sweden) respectively. Among the other social functions were a visit to Drogo Castle (organised by the Torquay branch of the E.A.W.), visits to H.M.S. "Royal Oak" and "Aurora" the Royal Naval College, Dartmouth, Dartington Hall, Mount Edgcumbe, and Powderham Castle.

On Friday, July 1st, parties paid visits to the television studios at Alexandra Palace, the studios at Broadcasting House, the National Physical Laboratory, the international and trunk telephone exchanges, the Post Office research station and the Battersea power station.

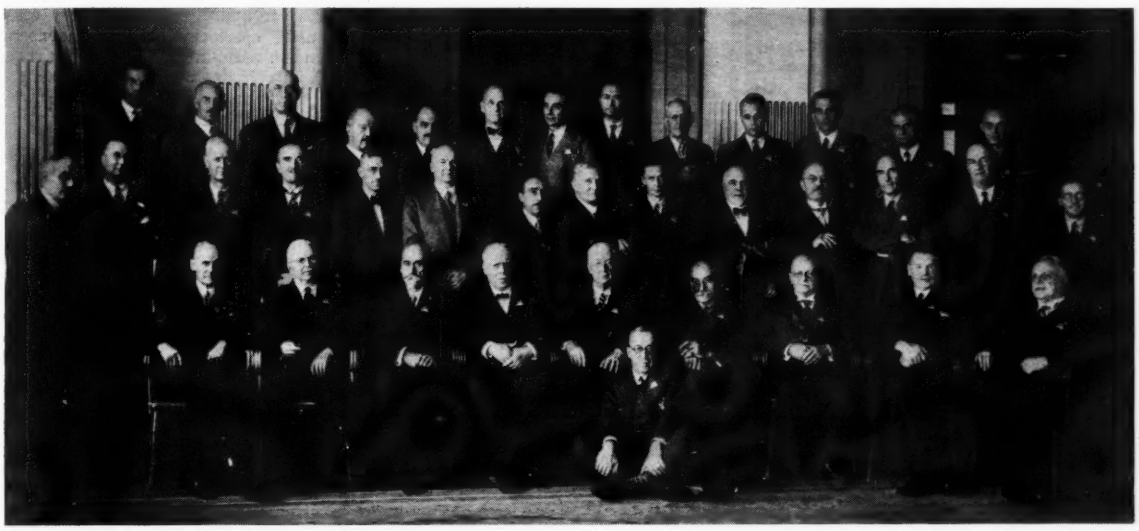
Turning to the "business" side of the meeting, the following is a brief résumé of the work of the various Advisory Committees:—

No. 1. International Electrotechnical Vocabulary.—The first edition of this Vocabulary, which has been in preparation for over a quarter of a century, was approved for publication. It includes nearly 2,000 scientific and technical terms, divided into 14 groups, each definition having been drafted originally in French and translated into English.

It was appreciated that the Vocabulary was imperfect, and would require early revision. It was decided that each National Committee shall receive copies for distribution to all competent persons and organisations in its country for their comments. Such comments as the National Committee may consider useful will be sent to the Central Office, which will transmit them to the chairman of Advisory Committee No. 1 for reference to its various sub-committees. The work of these sub-committees will then be co-ordinated by Advisory Committee No. 1 with a view to final revision of the Vocabulary. On the question of an acoustical vocabulary it was agreed that there should be co-ordination with the I.S.A., after that body had completed its work on acoustics.

No. 2B. Transformers.—Up to the present it had been found impossible to reconcile the divergent practices of rating transformers in different countries. The two most generally used bases are (*a*) the full-load secondary current and the no-load secondary voltage, and (*b*) the full-load secondary current and the full-load secondary voltage at a specified power-factor (of the order of 0.8 or 0.85).

At Torquay agreement was reached that two ratings should



The Committee of Action and Council of the I.E.C.

Back Row: Mr. P. L. Alger (U.S.A.); Dr. C. C. Paterson (Great Britain); Dr. Bernard Price (South Africa); Prof. Niebuhr (Argentina); Prof. Barbagelata (Italy); Dr. Wallot (Germany); Mr. Pochobradsky (Great Britain); Mr. C. A. Powel (U.S.A.); Mr. I. E. Moultrop (U.S.A.); Mr. McNair (U.S.A.); Mr. De Zoeten (Holland); M. Patry (France); Mr. A. J. Grant (Canada).

Middle Row: Mr. P. Good (Great Britain); Mr. L. F. Adams (U.S.A.); Mr. F. H. Clough (Great Britain); M. Gillon (Belgium); Mr. Wiesthaller (Germany); Prof. Drewnowski (Poland); Dr. Artigas; Mr. Norberg (Sweden); Mr. Carstensen (Denmark); Mr. Huber-Stockar (Switzerland); Prof. List (Czechoslovakia); Lt.-Col. K. Edgcumbe (Great Britain); M. Uytborck (Belgium); Mr. Ruppert (Central Office).

Front Row: Prof. van der Bilt (Holland); Dr. Clayton Sharp (U.S.A.); M. Duval (France); Prof. Lombardi (Italy—President); Mr. James Burke (U.S.A.—Past-President); Mr. Roger T. Smith (Great Britain); Dr. Kloss (Germany); Prof. Jacobsen (Norway); Prof. Giorgi (Italy).

Front Centre: Mr. C. le Maistre (General Secretary).

be given on the plate, namely, the I.E.C. test rating, and the I.E.C. service rating. When no power-factor is specified by the purchaser the service rating is to be based upon a power-factor of 0.8. Losses are to be expressed in kilowatts and not as a percentage efficiency and fractional loads are to be expressed in terms of current. The test rating defines a transformer in which it might be desired to reverse the direction of flow of power, and the service rating defines a transformer with a predetermined direction of flow.

Ambient temperature was defined to the effect that the peak value of 40 deg. C. should be associated with an average temperature not exceeding 35 deg. C. over any 24-hour period. It was agreed that the maximum temperature-rise for oil immersed transformers with forced oil circulation should be 65 deg. C.

No. 3. Graphical Symbols.—Proposals for the revision and extension of I.E.C. Publication 35, Graphical Symbols, were discussed, and the National Committees were invited to submit proposals for further sections dealing respectively with electronic devices (rectifiers), time switches and clocks.

No. 5. Steam Turbines.—It was decided that the measurement of flow of fluids in a pipe should be made by means of nozzles or orifice plates, or by means of calibrated Venturi tubes. In this connection it was agreed that the current issue of the I.S.A. recommendations should be adopted, on the understanding that all proposed modifications of or additions to the relevant I.S.A. documents would be presented in preliminary form to the I.E.C., to give it an opportunity to make comments. The I.E.C. Committee in its turn will pass on to the I.S.A. Committee all information relating to measurement of fluids likely to interest it.

Consideration was then given to the methods of testing turbines other than straight condensing turbines (these having already been dealt with in I.E.C. Publication 46). It was agreed that guarantees on these turbines should be expressed as steam flow and power output, and not in terms of heat rate.

A proposal made by Mr. Darrieus (France), which was first discussed in 1935 but dropped as being then too advanced, will again be considered at the next meeting, as there is a prospect of its replacing the present I.E.C. method. It was further agreed that performance tests carried out under conditions differing from the specified conditions should be corrected by means of curves forming part of the contract.

No. 6. Lamp Caps and Holders.—A report by the Indeco Committee covering the dimensions of an extensive range of lamp caps and holders was approved subject to minor modifications, and these dimensions will be incorporated in an I.E.C. publication. Drawings of suitable gauges were approved, but their use will be optional, each National Committee deciding for itself the form of the gauges to be used for checking the dimensions.

No. 7. Aluminium.—At last unanimous agreement appears to have been reached regarding the use of steel-cored aluminium conductors for overhead lines. It was agreed to define annealed aluminium as aluminium which, in the form of wire of 1 mm. diameter and greater, has a maximum tensile strength of 9.5 kg and a minimum elongation of 20 per cent. in a length of 200 mm., the measurement of the elongation to be taken after fracture. The normal resistivity value should be 0.0278 ohm mm^2/m, at a temperature of 20 deg. C. The density of annealed aluminium was agreed at 2.70 at 20 deg. C., and the coefficient of variation of resistance with temperature at 0.004 per deg. C.

Hard-drawn aluminium was defined as aluminium which, in the form of wire of 1 mm. diameter and greater, has a minimum tensile strength of 15 kg/mm^2; the normal resistivity value shall be 0.0284 ohm mm^2/m. at a temperature of 20 deg. C. The temperature coefficient and density for hard-drawn aluminium are taken to be the same as for annealed aluminium. With regard to the steel core, it was agreed to adopt a minimum tensile strength of 120 kg/mm^2 and an elongation of 5 per cent. for wires of 3 mm. diameter and over, and 4 per cent. for wires which are smaller than 3 mm. diameter.

With a view to standardising a test for the galvanising of these wires, samples produced in all the countries concerned had been interchanged, but the variations found in results already obtained are such that agreement could not be expected at the present time. Regarding standards of resistivity for aluminium as used for insulated cables and bus bars agreement was reached, as well as regarding certain standards for aluminium alloys for overhead lines and for the strength of joints in aluminium wires.

No. 8. Standard Voltages and High-Voltage Insulators.—A revised edition of I.E.C. Publication 38, Standard Voltages, will include in the section dealing with pressures between 100 and 1,000 V, an additional column to show the three-phase phase-voltages corresponding to the three-phase phase-to-neutral voltages. The proposal to standardise two-phase voltages above 100 V was not supported. An International Specification covering the testing of insulators has been under discussion for many years, and a first edition is to be issued. Impulse voltage tests are to be incorporated in the specification for the testing of line insulators.

A draft specification for the testing of bushing insulators was referred to the National Committees for consideration. A report making recommendations for the revision of the I.E.C. calibration tables for sphere-gaps was approved by the meeting.

No. 9. Electric Traction Equipment.—Several National Committees having submitted proposals for the revision of the I.E.C. specification for traction motors, and a substantial measure of agreement having been reached, a revised edition of the specification is to be circulated to the National Committees for approval.

On the question of rules for the electrical equipment on rolling stock, agreement was reached regarding a number of matters relating to single-phase equipment, but d.c. equipment is still under consideration.

No. 12. Radio Communication.—It was decided that modifications in the draft safety regulations for mains-operated radio receivers were desirable, and the secretariat was instructed to prepare a revised draft which would be circulated to the National Committees for approval. Preliminary consideration was given to draft specifications for condensers as used in radio receivers and in radio-interference suppressors and for symbols relating to electrodes and electrical magnitudes of electronic tubes (thermionic valves). A number of matters were referred to Advisory Committee No. 25, Letter Symbols.

No. 13. Electrical Instruments.—Various matters in connection with the revision of the following publications were discussed:—No. 43, Alternating Current Watt-Hour Meters; No. 44, Instrument Transformers; and No. 51, Indicating Instruments. As regards Publication 43 the main decision was the deletion of references to Class B meters.

A joint meeting with the Advisory Committee on Terminal Markings was held, and a sub-committee was appointed to consider the question of marking instrument transformers separately from instruments and meters.

No. 15. Shellac.—Consideration was given to a proposal that the scope of this Committee should be extended to cover electrical insulating materials in general, but it was decided that the matter could be more easily handled by the setting up of a new Committee.

The chairman, Mr. A. J. Gibson (Great Britain) presented a report on the progress in the applications of lac in the electrical industry during the past three years.

No. 16. Terminal Markings.—Owing to the divergent systems in different countries the I.E.C. is unable to issue a Standard Specification for terminal markings. A report has been prepared, however, summarising the various systems of terminal markings in use, the three most important of which are (*a*) that in use in the U.S.A. as recorded in A.S.A.-C.6 (1938) issued by the American Standards Association; (*b*) that in use in Great Britain, dealt with in a report shortly to be issued by the British Standards Institution; and (*c*) a composite method based on different existing systems on the Continent of Europe, arrived at after discussions in Advisory Committee No. 16. The I.E.C. will probably publish a report dealing with system (*c*).

No. 17. Switchgear.—Detailed proposals had been submitted by several countries for the extension of the I.E.C. Specification for a.c. circuit-breakers. The British proposals, which were very comprehensive, had been circulated only a few weeks in advance of the meeting, and so could not be discussed except in a preliminary way, but the documents have been referred to the National Committees for further consideration.

Discussion centred mainly on insulation tests, impulse voltage tests, and the natural frequency of the test circuit and rate-of-rise of recovery voltage. There was also a general discussion on the testing of large circuit-breakers. No final decisions were recorded.

No. 19. Internal Combustion Engines.—A revised draft of the Specification for internal combustion engines will be circulated to the National Committees for approval. Considerable modifications were made to draft "Rules for Acceptance Test," which will eventually form part 2 of the complete specification, and a revised draft will be circulated to the National Committees.

No. 20. Electric Cables.—A number of points relating to the testing of high-voltage cables were referred to a sub-com-

mittee for detailed examination, with a view to revision of the I.E.C. Specification for cables.

No. 22. Electronic Devices.—This Committee is endeavouring to draft a specification for mercury-arc rectifier equipment, including the transformer, and in this connection it will collaborate with Advisory Committee No. 2B (Transformers).

A sub-committee was appointed to prepare a sub-division of the work covered by the generic term "electronic devices," and to draft proposals for the scope of the work that might usefully be undertaken.

No. 24. Electric and Magnetic Magnitudes and Units.—At the last meeting of this Committee (in 1935) the Giorgi (M.K.S.) system of units was adopted, and the question of the choice of the fourth unit was referred to the National Committees for consideration. The Committee agreed at Torquay to recommend that the connecting link between the electrical and mechanical units should be the permeability of free space (μ_0) with the value of 10^{-7} in the unrationalised system, or $4\pi 10^{-7}$ in the rationalised system. It was further agreed to recommend that the name of this fourth unit should be the "Newton."

No. 25. Letter Symbols.—This Committee was concerned with the revision of I.E.C. Publication No. 27, and a revised edition will be circulated to the National Committees for approval.

No. 26. Electric Welding.—This was the first meeting of the Committee. Its work will be confined in the first instance to welding plant and equipment in co-operation with the committee on welding recently set up by the I.S.A.; a liaison officer is being appointed. The discussion then proceeded under the following headings, which were those submitted by the British Committee as a basis for discussion:—Definitions, rating of welding plant and equipment, non-automatic single-arc d.c. welding sets, automatic single-arc d.c. welding sets, constant-voltage multiple-arc d.c. welding sets, electric motors, air-cooled d.c. reactors, and chokes and transformers.

On the completion of the review of the British proposals it was agreed that certain matters should be referred to the National Committees for consideration, and that the whole subject should be discussed at a future meeting.

The Guildhall Banquet

At the banquet given at the Guildhall on July 1st Sir Frank Heath (chairman of the British Standards Institution which was responsible for the banquet) presided over a gathering of nearly 600.

The Duke of Kent, proposing the toast of "The International Electrotechnical Commission," referred to its work as the co-ordination of the electrical requirements of industry throughout the world. By powerful penetration its recommendations were gradually influencing the electrical standards of all nations, which were free to adopt them if and when they found it desirable to do so. Most of the twenty-eight countries affiliated had been represented at the Torquay meeting. The international vocabulary of electrical terms and definitions, to the preparation of which Professor Lombardi had given so much time and energy, would be most useful to buyers and sellers of plant and machinery.

Responding, Professor L. Lombardi (president, I.E.C.) recalled how he took part in the first meeting, which was held in 1904 at St. Louis. He regretted the absence of Col. R. E. B. Crompton, to whom was due the inception of the International Electrotechnical Commission.

The health of the Lord Mayor, who had placed the Guildhall at the disposal of this "international Parliament of electrical engineers," was proposed by Mr. T. St. Quintin Hill (Comptroller-General, Department of Overseas Trade) in those terms. The Lord Mayor (Sir Harry Twyford) in his brief response referred to himself as having been once an electrical engineer.

The I.E.E. Conversazione

EACH year sees an increase in the number of those who come from all parts to attend the annual conversazione of the Institution of Electrical Engineers. On June 30th well over 2,000 members and guests were received by the President, Sir George Lee, and Miss Margaret Lee. Included in these was a large contingent drawn from the 450 people who had been attending the plenary meeting of the International Electrotechnical Commission at Torquay and had travelled up to London by special train on Thursday to attend the function at the Natural History Museum, South Kensington. These strengthened the overseas element which one is always pleased to find present on such occasions, as well as at the conversazione given a few weeks earlier to overseas members. There seemed also to be more representatives of the local Centres than are to be found in London at any time with the exception of the I.E.E. dinner. That the Conversazione should be held at South Kensington seems by now to be a part of the established order of things, but probably few had realised before Sir George Lee mentioned it at the dinner last February, that the first Conversazione took place at South Kensington in 1883.

Above: A general view of the Conversazione in progress. Below: Sir George and Miss Lee receiving the guests, and some of those present. *[Elec. Rev. photos.*

The Glare Problem

By D. G. Sandeman, B.Sc., A.M.I.E.E.

Investigations from a new angle

In this article the author traces the glare effect of street lighting as viewed from a mobile point of view and demonstrates how constant visibility can be obtained

TOO much stress has been laid lately on the "static" view of street lighting. In this case the observer is stationary and sometimes the near lamp is extinguished. Such conditions are never obtained in practice, where both observer and the object which he seeks to avoid are moving. Street lamps are usually so far removed from the line of view that their glare effect is negligible, or, more accurately, it escapes notice. The effect is perceptible even with the highest mountings and affects the visibility. This can be very easily demonstrated at night, when an immediate improvement in visibility is obtained by shading the eyes from the light of the near lamp.

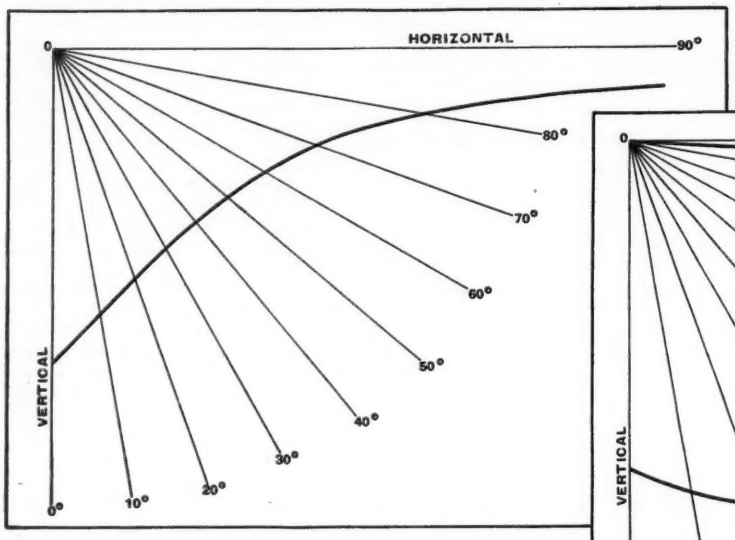


Fig. 1

In an article under the same heading in the ELECTRICAL REVIEW of January 10th, 1936, it was shown that if one adopts distribution of light similar to fig. 1 the visibility tends to become constant, and is practically unaffected by the presence of the near lamp. In addition, high surface brightness is obtained and, furthermore, a lot of light is allowed round the base of the pillar. The glare experienced depends on the number of lamps in view and not as before on the position of the observer relative to the near lamp.

Fig. 2 represents the glare effect produced by a lamp having a circular polar curve, or giving the same candle power in every direction. Instead of recording candle-power, the glare effect at every angle has been plotted, there being a striking resemblance to the polar curve of an ordinary street lamp. The glare effect produced by a lamp having a candle-power distribution similar to fig. 2 would be of a twofold nature, an objectionable result. By altering the distribution to fig. 1 a twofold improvement would be effected.

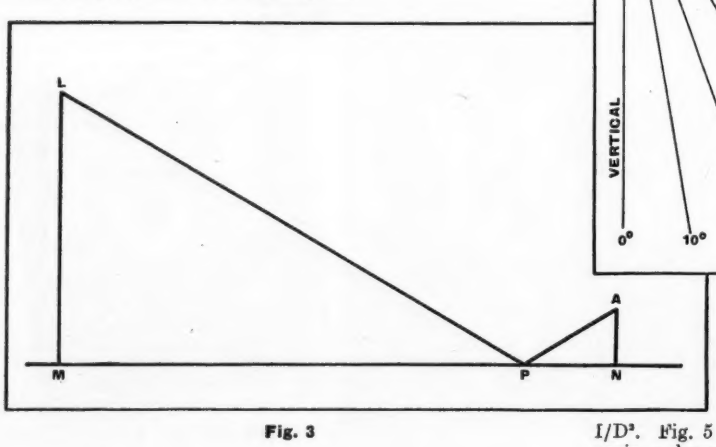


Fig. 3

Approaching the subject from a different angle, consider in fig. 3 a moving observer A approaching a lamp L and looking at a moving point P on the road surface. For convenience in calculation let the angle APN equal the angle LPM. Fig. 4, which has been calculated from data given in the booklet on "Reflection from Road Surfaces," by A. K. Taylor, Technical Paper No. 9, Department of Scientific and Industrial Research, gives the candle-power necessary in the direction LP so that the point P appears always of the same brightness when viewed from A. The shape of this curve is very similar to the important part of fig. 1 and one may conclude from this that the type of light distribution depicted in fig. 4 will tend to produce a constant surface brightness from the point of view of a moving observer.

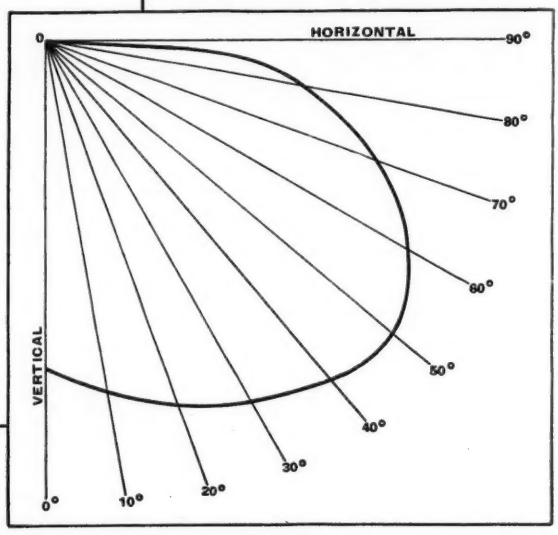


Fig. 2

Glare may be produced by reflections from parts of the observer's car. For instance, if the bonnet is inclined at an angle of β to the horizontal, then the glare from regular reflections becomes $\frac{I}{h^2 \mathrm{cosec}^2\alpha(\alpha+2\beta)^2/_2}$ which, if β is small, gives a constant glare curve similar to fig. 1. Usually glare is from curved surfaces, such as the top of the wings or the polished metal parts about the wind screen. In cases such as these the angle between the line of vision and the disturbing reflection is approximately constant and glare is proportional to I/D^2. Fig. 5 is a corresponding constant glare curve. Here again a large value of candle-power at angles approaching the horizontal is not detrimental.

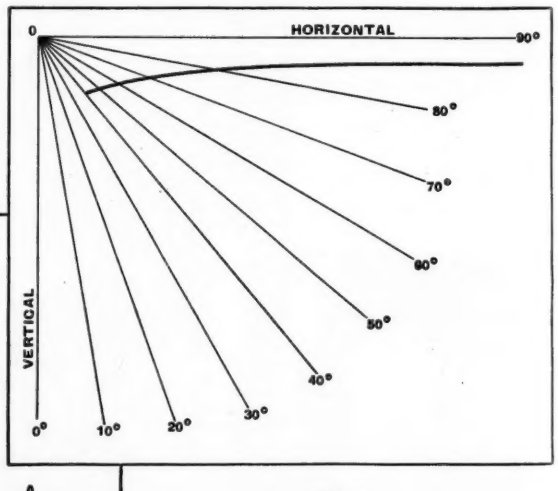


Fig. 4

At first the author was disappointed in his efforts to interest

Correspondence

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions

Who Should Supply Electrical Fittings?

The paper read by Mr. W. Cross, at the E.C.A. Conference, Hastings, is excellent, but there are other interests to be considered in the industry. It may be useful to have a manufacturer's ideas on the subject and by comparing views be able to form a balanced opinion. The supply of electrical fittings was originally and rightfully in the hands of the contractors, but many have lost grip after having had a good start and there are many reasons for the present situation. Among them the following may be mentioned:—

Lack of supporting attractive showrooms which has brought about competition from stores, supply undertakings and ironmongers. The inclination of many contractors to purchase imported goods, which has naturally led the English manufacturers to see for themselves that their products are specified. Selling needs study to march along with events, methods and design, and the contractor being primarily a technician does not always give the selling side of his business all the attention it deserves. On contract work the contractor, being assured of his reservation, is quite willing to leave it in other hands, instead of getting on to the job early and putting up his own scheme.

In the *first* General Principles of the Fair Trading Policy for Home Trade the following appeared: "That discounts allowed from manufacturers' list prices should not be regarded as perquisites or gratuities but as payments for services rendered in selling or influencing the sales of the manufacturers' products." Nothing could be fairer or more definite in its meaning.

Why cannot the manufacturers' discount be split—we will not go into the exact proportion here—part for the seller and the remainder for the fixer? If the contractor does both, good luck to him; he will get all the discount.

To pursue the theory, shall we say that for fixing 15 per cent. is equitable and carry the principle still further and apply it to p.c. contracts? Let the E.L.F.A. and E.C.A. get together with the R.I.B.A. and establish a definite "plusage" in all their contracts, as the builders have done. If this could be achieved we should all know what to do, but at the moment something like the following happens:—

The contractor is asked to quote for a p.c. job and add his profit. He does not, but relies on the manufacturer's reservation, being afraid that his competitors will take the fittings on without profit and for the same reason some manufacturers' reservations vary. Too many jobs are going without carrying their proper profits, to the disadvantage to those who are trying to do what is right and fair. A county architect was recently quoted and when he called for the contractors' invoices he noticed that the prices were less than he had been quoted; the manufacturer concerned was struck off the list for making the reservation.

Enough has been said here to show some of the difficulties that we are trading under. Cannot the E.L.F.A., E.C.A., and B.E.A.M.A. get the R.I.B.A. to recognise the contractor at a definite "plusage" on p.c.? MANUFACTURER.

July 4th.

Radiant Heat for Cooking

We were interested to read Mr. Myers's letter on this subject in your issue of June 24th and we would be very glad of any information, both pro and con, with regard to this matter. We would also like to know if it is possible to rewire existing high-pressure cookers and employ a transformer. Are there any firms dealing with reasonably priced transformers and wire for the cookers or radiators, &c.?

We would be glad to know if there is any legal objection, and possibly the way to overcome it, and also, any objection from the suppliers, and if there is any way of getting round it, as our point of view is that, as the customer holds the purse, he can supply what he likes in his own house, provided it is safe. A. & R. LITTLEDALE, LTD.,

Glasgow, *July 1st.* A. G. LITTLEDALE, Director.

The Supervisor's Job

Mr. H. E. Johnson's excellent article in your issue of June 17th only touches the fringe of the troubles in the contracting industry, and in view of the facts which have come to light over one fatal accident in a Renfrewshire housing scheme I should like to add to his remarks.

We, in Scotland, use a schedule known as "The Scottish Mode of Measurement," but it fails lamentably on the site for lack of expert supervision. Fully 75 per cent. of schedules concerned with the installation of electricity in public buildings, housing schemes and "competition" villas are compiled by architects and measurers whose knowledge of practical electricity and its working is nil. They can appreciate the value of equipment, of course, but they take on trust the very serious task of installing it.

It is here, if anywhere, that expert supervision will have to be brought in. Time and again, accidents have been traced back to the same origin, namely, people such as the above playing with words they hardly know the meaning of and finally playing with the work of installing. They walk from office to office, house to house, see another pendant and another switch erected and call that supervision on behalf of their principals! I have even seen included in an architect's schedule, "And a continuity test shall also be taken by means of a 'Megger.'"

The time is long past when each person entrusted with the business of making up specifications and schedules for the installation of electricity in buildings was an expert with practical and technical qualifications, able, as Mr. Johnson says, to go on the site, take off his jacket and get "stuck into it" and show the workers on the job how he wants the work carried out.

It is a lamentable fact in this enlightened age that we have in the electrical industry posing as experts such people as drapers, tailors and clerks in executive positions, dictating to men whose lifelong work has been the study of electricity. Many architects and measurers to whom I have spoken agree that they know very little about installation work but safeguard themselves by asking a contractor whom they can trust to keep them up to date and assist in preparing schedules. This method leads to some very biased schedules being issued. Then we have that other grave scandal, the monopoly schedule, obviously issued by a person with no knowledge of the industry or he would realise that no one manufacturer has a monopoly of the brains in the trade.

Many of these same architects, surveyors and county officials have shown me schedules which they thought "cast iron." Yet the same scamping by the unscrupulous contractor goes on at the expense of the public and more money will require to be expended to make these jobs safe. When will the industry as a whole take an interest in its own affairs and see to it that a person whose credentials can stand the light of day, who is competent technically and practically, in

The Glare Problem (*Continued from preceding page*)

manufacturers and others in the new type of distribution, but since then it has been found that the ordinary "open skirt" type of refractor can be focused so that a fairly close approximation to the fig. 1 light distribution can be obtained. So far

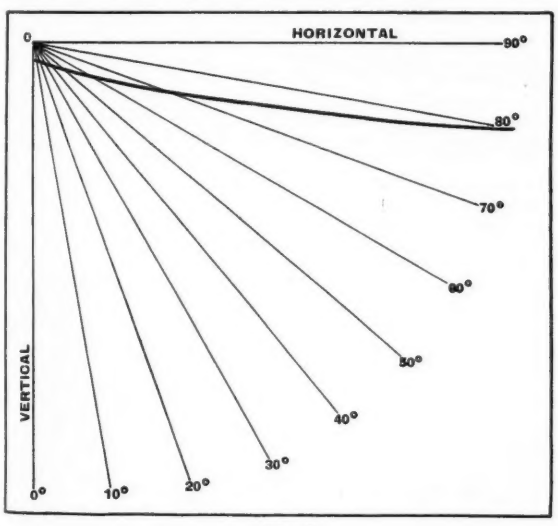


Fig. 5

from being a mathematical abstraction, it is possible to experience the "constant visibility" effect when passing below the lamps. One or two of the principal streets in Edinburgh, including Princes Street, have been provided with such fittings, with excellent results.

other words an expert supervisor, is appointed as electrical clerk of works to compile the schedule and also to enforce the code?

K. W. CAIRNEY.

Glasgow, *July 3rd.*

Radio Interference

I am interested in your leading article on this subject and the excellent article by Mr. G. W. Ingram in your issue of July 1st. From your leading article it would appear there is urgent need for legislation, and a deplorable lack of action on the part of the responsible authorities. I would like to suggest that this lack of action is mainly the result of the extremely complicated nature of the subject. It is not a simple matter to suppress interference, and the cost is not a small additional item in most cases. It must first be remembered that: "Any change in the electrical conditions of a circuit gives rise to a spectrum of components of current or voltage, and the more abrupt the change the higher will be the frequency to which these components extend. Nearly all classes of electrical equipment are subject to these rapid changes. Thus nearly every item of electrical equipment may be regarded as a potential source of radio-frequency energy."

It seems therefore that in order to enforce legislation practically every manufacturer of electrical equipment must fit some form of suppressor to his equipment. As there is no such thing as a standard suppressor unit every individual case must be treated on its merits in view of the multiplicity of conditions existing on site, such, for example, as the nature of supply, a.c. or d.c.; earthing or non-earthing; position and condition of aerial; distance from source of interference; nature of receiving set; if condensers only are required and their capacity, or condensers and chokes, and how they are to be connected in circuit.

It becomes impossible for a manufacturer to turn out apparatus which is radio interference free in all cases. Then, again, quite a large proportion of apparatus goes into service where radio interference is of little or no importance. In such a case if all appliances were fitted with suppressors a considerable amount of time and money would be wasted. On the other hand, a manufacturer has no knowledge when dispatching plant if suppression is required on his appliance, and even it he does know he cannot tell what type suppressor to fit. If he has to investigate every case and try out suppression it is going to be a very costly business. Again, the ratio of signal strength to interference as laid down by the G.P.O. will not satisfy every listener as it only guarantees good reception on the two London stations, the National and the Regional. Hence legislation is difficult for a great many reasons. It might be possible for the manufacturer of receiving sets to put a set on the market proof against radio interference on the National and Regional with some success.

London, W.4, *July 4th.* C. W. DENNY, A.M.I.E.E.

[Mr. G. W. Ingram comments as follows on Mr. Denny's letter:—"While there is no standard cure or standard suppressor, it is possible, in 50 to 60 per cent. of the cases traceable to electrical machines, to interpolate small condensers of the order 0.01 to 0.1 mF at the terminals of the apparatus, or even arrange for the condensers to be built in, and the results are effective. With regard to treating each case on its merits the important points are:—

"C. The aerial system must increase in efficiency with the sensitivity of the receiver. This may seem contradictory, but when the problem is considered on the basis of the ratio of distant signal strength to the strength of spurious signal due to local interference, with a multi-valve high sensitivity receiver an anti-static aerial system is seen to be almost a *sine qua non* for good local and distant station reception, otherwise full advantage of the high selectivity and sensitivity features cannot accrue.

"D. This point is only of importance where interference is proved by test to be due to 'directly radiated interference.' The other two types of interference, however severe, will be countered by the use of suitable types of suppressor units.

"F. The electrical value of chokes and/or condensers for suppression will depend upon the wave range or frequency band over which interference is experienced. For chokes this may be said to be the peak reactance value obtainable over any given frequency range, compatible with current carrying purposes and the drop of inductance which is experienced when a choke is carrying currents of the values usually met with in motor or generator practice.

"The manufacturer can obtain the knowledge of local requirements by the use of either a simple industrial type of cathode-ray oscilloscope or a valve voltmeter with tuned input circuits covering the normal broadcasting bands or a radio receiver. If any manufacturer has decided that he will apply suppression to all his equipment and manufactured articles he can purchase one of the special types of signal strength measuring set to the International Electrotechnical Commission specifications. Or, again, he can solve this problem by employing for a short time an experienced suppression engineer.

"The question of the basis of legislation from the aspect of the technical requirements has held up the matter for the past four years, but a statement is in course of preparation as a *projet de loi.* The desire of the G.P.O. is to share the onus of suppression between the user of electrical equipment, the manufacturer and the listener, which implies that the manufacturer will either redesign his gear or add suppressors to ensure that at the terminals of the apparatus the interference signal injected into the supply mains shall not exceed a given figure over a determined frequency range. This will not completely solve the problem as owing to technical factors this signal may be amplified and/or diverted in such a way that sufficient will reach the receiving set, unless the receiver is efficient, together with the aerial and supply circuits."]

Electrical Development in Rural Wales

ON Wednesday at the Farmers' Electrical Conference held at the Royal Show Mr. W. H. Jones, of the Department of Agricultural Economics, University College of Wales, Aberystwyth, read a paper on "The Development and Uses of Electricity in Rural Wales." Outlining the problems of supplying electricity, the author pointed out that apart from the industrial areas, the population of the country was very scattered and the density low. While in England 20 per cent. of the population lived in rural districts, in Wales only about 12½ per cent. did so. Farms were small, two-thirds being under 50 acres, and actually a half under 20 acres.

Nevertheless progress had been made, and between 1923 and 1936 the records of the North Wales Power Co. and its associated concerns showed increases of from 110 to 1,077 miles in length of transmission lines, from 31 to 570 in the number of sub-stations, and from 4,808,000 to 42,423,000 kWh in annual sales of electricity, the average price per kWh falling from 5.10d. to 2.49d. Between 1927 and 1936 the number of consumers rose from 2,344 to 34,665. In the West Cambrian Power Co.'s area the number of consumers advanced from just under a thousand to over three thousand in the past five years, while at the end of 1937 the South Wales Power Co. had over 34,000 premises connected out of 42,000 within reasonable distance of the mains.

The capital cost of extending electricity supply facilities through such a difficult countryside had to be justified by the results obtained, and electricity's contribution to progress in Wales could best be in the form of such labour-saving services to farmers as milking, clipping and shearing, the grinding of feeding stuffs, transport of materials on the farm, pumping and lighting. With the shortage of farm labour farmers were very conscious of the necessity for calling upon machinery to economise in man power.

On Welsh farms power was primarily needed for field work. The cost of electrical ploughing units, pneumatic conveyors, &c., as used increasingly in Germany, was a difficulty which might be solved by joint effort.

The first essential in dairy work was adequate illumination. Due to ease of handling, cleanliness and absence of fumes, electricity was undoubtedly the best source. Greater use could be made of portable milking machines, and before some farmers could satisfactorily turn to milk selling they must have better cooling plant installed. In addition to milk cooling the electric refrigerator had many other uses on the farm. In fact, there was need for a dual-purpose model that could be used both for farm and domestic purposes.

On the smallholding in particular there were a very large number of odd jobs such as water pumping, wood sawing, root pulping, &c., to be done. Portable electric motors could easily be taken from one part of the field to another, and having a considerable overload capacity they were economical to run.

Improved egg yields had been attained in many instances by artificial illumination with the object of lengthening the effective day during which the birds were active. With this device a dimming arrangement was essential to send the birds back to the perches before the lights were finally extinguished. Electricity was gradually displacing other methods for incubator heating, and the egg-testing lamp was proving invaluable.

Among the sources of demand for electricity must also be included private houses and rural industries, which now included the processing of certain farm products. Up-to-date large-scale electric abattoirs might supersede some of the badly equipped slaughter-houses.

For the best results electrification should start on the basis of the complete electrification of the village and it should extend from the village to all surrounding farms and scattered villages. A plan should be made for complete wiring covering the whole of the district, and the district as a whole should be the unit for calculating revenue, although individual users would be separately assessed.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Time-switches and Relays

Time switches that embody the main features which characterise the products of SORDOVISO, LTD., 220, The Vale, Golders Green, London, N.W.11, are now available for a variety of uses. Type 39 is designed for a quick make and delayed break, for closing a circuit for a limited time period when actuated by an impulse current of a fraction of a second. It can thus be employed as a staircase time switch, or for starting motors, driving syrens or pneumatic tubes, which are required to stop automatically after a certain period.

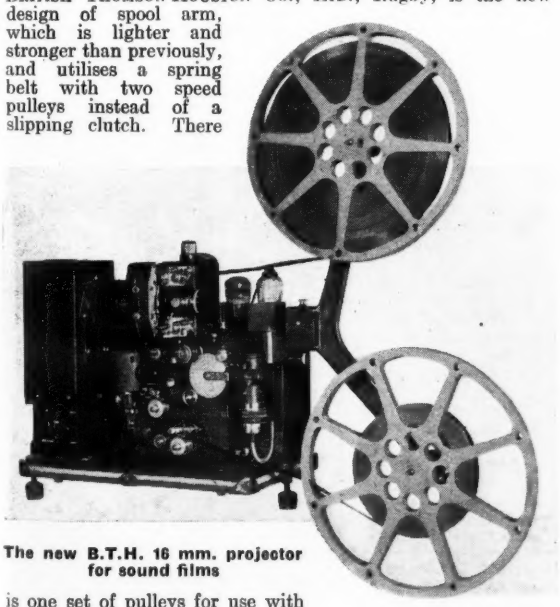
These switches are available with normally open contacts and a range of timings from one second to five minutes, in three standard ratings of 5, 10, and 15 A. Each type will withstand momentary surge currents of many times the normal rating. The control circuit is independent of the main contact circuit, but the time feature depends to a certain extent upon the supply voltage, and a tolerance of plus 15 per cent. must be allowed. When used to control a d.c. circuit a condenser of from 4-8 mfd. should be connected in parallel with the two terminals of the mercury switch. Dimensions of the complete relay contained in a bakelite box for ratings up to 15 A are 7 in. by 4¼ in. by 3¼ in.; weight, 3 lb.

Contactors for use with relays for automatic or remote control of circuits from 5 to 100 A at up to 500 V have also been developed. In some a ratio of 1:20,000 is possible between the operating and the controlled current, and arcing on contacts is reduced. The provision of a low-voltage supply, such as is often required for reducing their deterioration, is thus unnecessary. The energising coil and the magnetic circuit are small, thus making possible a light and compact instrument, and the contact surfaces are hermetically sealed in a glass container, for use safely in the presence of explosive gas, dust or vapours.

The contact is made between mercury and mercury and there is, therefore, no reduction in contact area with use, there is no tilting and no heavy plungers likely to break the glass container. This type of contactor will withstand an overload of 100 per cent. and surge currents of many times its normal rating, and may be switched on and off many times a minute without undue overheating or damage. It may be operated by a single-pole switch, pressure switch, float switch, thermostat, light sensitive relay, &c., or by push buttons. It changes from closed to open and vice versa with an extremely small change in the control current, and thus forms a very sensitive voltage or current relay.

Sound Film Projector

A feature of the latest 16 mm. sound film projector of the BRITISH THOMSON-HOUSTON CO., LTD., Rugby, is the new design of spool arm, which is lighter and stronger than previously, and utilises a spring belt with two speed pulleys instead of a slipping clutch. There is one set of pulleys for use with 400 ft. spools, and by changing over the driving belt spools of 800 ft. and 1,600 ft. can be used. A tone control is provided.



The new B.T.H. 16 mm. projector for sound films

When the equipment is used in large halls and for audiences between, say, 500 and 1,000 people, a new speaker unit can be employed, comprising a 14-in. diameter permanent magnet moving coil speaker with a special cone, fitted in a directional horn, when portability is not essential. The projector lamp is rated at not more than 300 W.

A Shelley china tea set and table lamp

Pottery Table Lamp

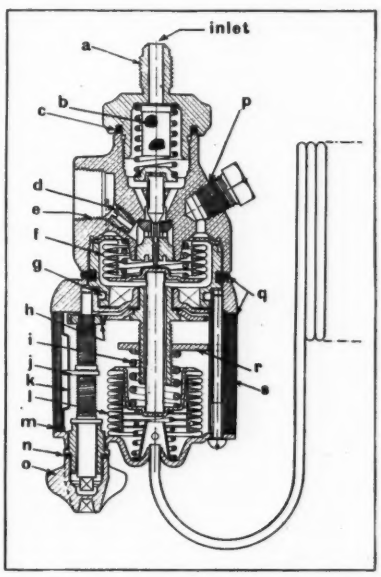
Makers of pottery of all kinds for many years, SHELLEY POTTERIES, LTD., Longton, Staffs, have now commenced the manufacture of pottery table lamps. A wide range of designs is available, and a novel introduction is a china tea set and decorative table lamp made to match.

This is shown in the accompanying illustration. The idea, however, has very many applications, apart from tea and coffee sets.

Expansion Valves for Refrigerators

A new range of automatic expansion valves for the control of refrigerator plant has been introduced by the BRITISH THERMOSTAT CO., LTD., Sunbury-on-Thames, Middlesex.

Types S.P.A.F. and L.P.A.F. in which the degree of opening of the valve is governed by the evaporator pressure, are intended mainly for domestic refrigerators and small plants working at a constant temperature and where the load does not vary greatly. The S.P.A.F. model has a 0.6-in. diameter seat, but 0.4- or 0.8-in. seats can be supplied for refrigeration capacities of from 3,000 to 30,000 B.th.u. per hr., depending on the kind of refrigerant used. For the standard L.P.A.F. model the seat is 0.11 in. in diameter, but a 0.17-in. seat is also available; in this case the capacities are from 24,000 to 120,000 B.th.u. per hr. A squared adjusting spindle is normally sealed off by a domed cap which screws down on to a composition joint, giving a range of from 20-in. vacuum to 20 lb. per sq. in.



The Teddington thermostat

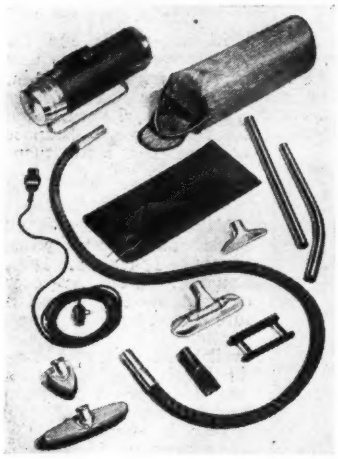
(a) Screw thread. (b) Filter. (c) Trapped metal joint. (d) Discharge tube. (e) Body tapped ¾in. Briggs. (f) Gland bellows. (g) Bayonet catch, to detach thermostatic element twist in anti-clockwise direction. (h) Geared adjustment. (i) Range spring. (j) Indicator. (k) Scale. (l) Thermal bellows. (m) Rubber joint. (n) Joint. (o) Combined adjuster and sealing cap. (p) Tapping for equaliser connection. (q) Rubber joint. (r) Spring adjuster. (s) Transparent bakelite moulding.

In types S.T.A.F. and L.T.A.F. the valves are similar to those of the foregoing, but their opening is controlled by a separate thermostatic element, which is secured to the valve body by a bayonet joint. This element can be removed without disconnecting the valve from the pipe line, thus obviating risk of moisture entering the system during any maintenance work. As it is housed in a transparent bakelite moulding, the setting scale is clearly visible. A new method of operating the bellows has been adopted in which the movement of the latter is opposed by a spring, the load of which can be varied by a spindle at the side of the valve. The bellows is anchored at one end and the total movement is restricted by stops with a view to preventing any tendency to permanent deformation or entry of moisture. The whole thermal assembly is also hermetically sealed. Seating diameters and refrigeration capacities are the same as in the corresponding pressure-operated models.

D

Cylinder-type Vacuum Cleaner

The latest development by EUREKA ELECTRIC, LTD., 8, Fisher Street, Southampton Row, London, W.C.1, is a moderately priced cylinder model incorporating several special features.



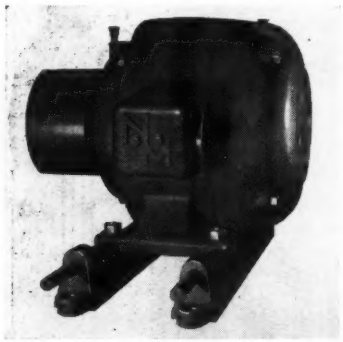
The new "Eureka" vacuum cleaner

A swivel connection, designed to be simple in operation but without loss of suction, has been provided for the hose, where it fits into the cleaner. The metal tubes when joined up enable the user to get under low furniture, and the swivel floor nozzle ensures effective cleaning, irrespective of the angle at which the tubes are held. The swivel floor nozzle permits the carpet to be slightly lifted off the floor, so that the air can pass through the carpet.

To facilitate the removal of the dust bag when it is to be emptied the motor end-cover permits the cleaner to be stood upright. A cloth bag is supplied for the attachments and a separate cloth bag for the cleaner, the cleaner bag being provided with a handle which permits it to be hung on a hook in a cupboard. The attachment bag can be dealt with in the same way.

Totally Enclosed Motors

NEWMAN MOTORS, a subsidiary company of Newman Industries, Ltd., Yate, Bristol, has just introduced a range of totally enclosed squirrel-cage a.c. motors of from ½-h.p. to 15-h.p. The principal aim in the introduction of the design has been to make available at a reasonable price a standard totally enclosed surface-cooled motor, embodying proved principles of construction, and suitable for universal application.

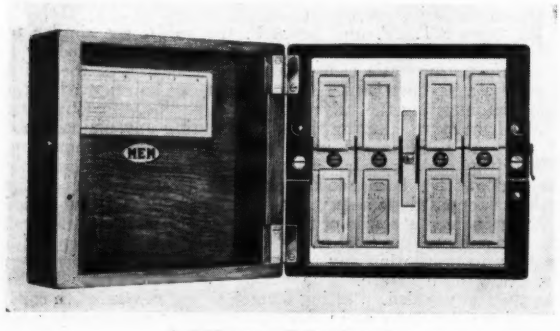


The Newman externally cooled squirrel-cage induction motor

As they are totally enclosed the windings are completely isolated from external air, so that the motor may be used in dirty and dusty surroundings and in moisture- or chemical-laden atmospheres. The performance is good, and in addition to high power factors and efficiencies the motors have a starting torque of 180 to 240 per cent. of full load when starting direct-on-line. Of special appeal to the practical man is the construction of the terminal base, which is in two parts to provide for ease of connecting. While the motors in the standard range are of the usual feet-mounting type, they are alternatively supplied for flange-mounting, and the flanges can be machined to manufacturers' requirements.

Switchgear Improvements

The MIDLAND ELECTRIC MNFG. CO., LTD., Reddings Lane, Birmingham, announces that certain of the lines which were withdrawn from manufacture during the autumn of last year have been reinstated. These include the "Memway" fuseboards, "Memten" switch-fuses and "Neon" and "Fireman" switches.



A "Memway" fuseboard

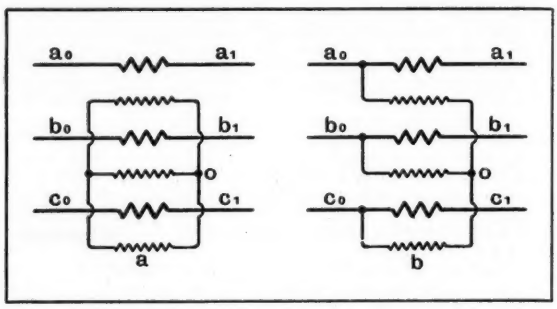
The "Memway" fuseboards re-appear in larger teak cases and the rating has been increased to 10 A, 250 V. A new fuse is incorporated and shields are now fitted on the three-way size and over. The "Memten" switch-fuse has been redesigned, and comprises a new and neater case, a new 10-A fuse and a switch movement which for robustness and smooth action compares favourably with the type normally employed on larger and more expensive switchgear.

In addition, five-way fuseboards—in all ratings from 10 A to 100 A, d.p. and t.p., 250 V and 500 V—have been reinstated by the company.

Voltage Regulation

A low-voltage tail-end booster that can be mounted on a distribution pole or in a disconnecting-box manhole has been developed by the HACKBRIDGE ELECTRIC CONSTRUCTION CO., LTD., Walton-on-Thames, Surrey. Its overall dimensions at the widest points are 2 ft. 7½ in. by 1 ft. 6 in. by 1 ft. 10 in. and its capital cost is said to be about the same as that of a static balancer of similar throughput.

In its one-step form the booster comprises a small transformer with a primary winding which may be either short-circuited, when no boost is given, or connected across the line in which case a voltage is induced in the secondary winding



The Hackbridge tail end voltage booster, showing (a) no-boost arrangement of primary connections, and (b) connections of booster in operation

(which is in series with the line), bucking or boosting the line voltage.

In order to limit the possible voltage rise while changing primary connections, the magnetising current is as much as from 30 to 40 per cent. of the normal full-load value, but since the magnetising current is only from 3 to 4 per cent. of the line current, the power factor is not affected.

In the case of the two-step booster, two auto-transformers (mounted in one case) are used. The first of these is permanently connected to give a definite value of boost; the primary of the second may be short-circuited or connected across the line to give either buck or boost.

The control relay is of the telephone type and the cutting in and out of the booster at the same value of voltage is assisted by a novel circuit in which the variations in the line voltage are magnified and applied to the control relay. Provision is also made to prevent the booster operating on transient voltage fluctuations and the cutting-in setting can easily be altered by the user.

Switches and Switch-fuses

The latest "Sandamax" switches and combined switches and fuses of WM. SANDERS & CO., LTD., Falcon Electrical Works, Wednesbury, Staffs, incorporate several unusual features, including the use of "Sandaspeed" fuse units which enable conversion to ordinary or high rupturing capacity duty to be effected by merely substituting the appropriate fuse carrier.

The remainder of the design is largely in accordance with modern practice, but the switch movement has been simplified. The fitting of a pressure die-cast operating handle in switches of this class is a new departure and the particular design of the handle and mechanism eliminates practically all side play, resulting in a sweet action.

Three knock-outs at both top and bottom allow of any wiring combination, abundant cable room being provided. The contacts, although fully protected, are easily accessible and the gasket round the lid makes the unit hose-proof. The usual interlocking arrangements and four-point fixing of the lid are incorporated.

The new "Sandamax" switch-fuse

New Books

The Magneto Manual. By H. R. LANGMAN. Third edition, Pp. 250. London: The Technical Press, Ltd. Price 6s.

Although so far as motor-cars are concerned the high-tension magneto has in recent years been almost entirely superseded by the battery, coil and distributor form of ignition, it still predominates in the case of motor-cycles and commercial vehicles as also in aeroplanes. One of the best testimonies to the usefulness of this work is that a third revised edition has become necessary to keep pace with developments.

In a series of thirteen chapters the author deals with his subject thoroughly. An innovation in the new edition is an attempt to explain the functioning of the h.t. magneto by a scheme used by the author for some years in connection with his lecturing work. The various forms of magneto, described and illustrated by drawings and sketches, include the rotary armature, sleeve and polar inductor types, instructions being given as to timing, setting and adjustment of the instruments. A useful feature of the book is that five of the concluding pages are devoted to a series of questions anent the technical details of h.t. magnetos and magneto ignition generally, by means of which users of the manual may gauge for themselves how far they have assimilated the instructional information afforded them in the preceding chapters.

While commending the book to automobile and aeroplane mechanics, we would suggest that, in view of the change that has taken place during recent years in the form of ignition used on cars, the statement in the first line of the second paragraph of Chapter I: "motor-car and aeroplane engines in this country are now almost exclusively fitted with h.t. magnetos" should be modified in any future edition.

Modern Physics. By G. E. M. JAUNCEY. Pp. 602; figs. 241. London: Chapman & Hall. Price 22s.

The author developed this book to meet a situation that is occurring in most universities and schools of science. The young student is taught classical physics; the modern conceptions of physics, so radically different in many ways, are left for him to discover on his own, or in post-graduate days only.

This is a book on modern physics for second-year science students and its arrangement is rather interesting. The author starts with a historical introduction; then follows a chapter on the necessary mathematics, as the prelude to physics, and from that he goes to wave motion in general and straight on to alternating currents as an example. Then we come to the electro-magnetic theory of radiation and by means of the electron to the special theory of relativity. The general theory has a brief reference later, when many other things have been done, along with cosmic rays and astrophysics. The book finishes off with a chapter on the philosophical questions raised by modern physics.

This suggests a real understanding of the place and function of natural knowledge. Through its historical past, through mathematics to general principles resulting from discoveries, to the broad philosophical conceptions that these principals compel. The arrangement is good.

The Fine Structure of Matter, by C. H. DOUGLAS CLARK. (Pp. 185; figs. 28). London: Chapman & Hall, Ltd. Price 15s.

This is the third part of Vol. II of a general work on crystal structure, polarisation and line spectra and it relates particularly to the quantum theory and line spectra. If one may be permitted to assume the invidious task of differentiating between one or more portions of the book and the excellent whole, special reference may be made to the sections on interaction between matter and energy, series spectra of the alkali metals, the ground terms of atomic and ionic systems, the Pauli exclusion principle, and valency and the periodic groups. The appendix—often, as in this case, a most valuable part of the book—deals with some spectroscopic relationships and is chiefly mathematical.

As with the previous parts, numerous references to the work of other investigators are given. Like its predecessors the book emphasises the progress which has been made during recent years in physical science and research, and the entire work should be a valuable addition to the physicist's technical library.

Evolution of Physics, by A. EINSTEIN and L. INFELD. (Pp. 320; illus.). Cambridge: University Press. Price 8s. 6d.

This book is in four sections, of which the first three could hardly be bettered. In these, physics, as the term is now understood, is traced from its initiation by Galileo to the stage to which it was taken, largely through the genius of Einstein ultimately, when the equations of general relativity had been formulated. The writers show with logical clarity how a mechanical view of things first arose, then met difficulties in the facts of electricity, magnetism and optics, and was finally replaced, more or less completely, once the path had been pointed out by Maxwell, by the concepts of the field and the ideas of relativity. The story is a fascinating one, told without mathematical symbolism, so that it should be followed without difficulty by anyone with only rudimentary ideas of physics or engineering, and yet with so many penetrating comments that the most advanced workers can hardly fail to find it illuminating.

The fourth section, on quanta, is less well rounded off, a fault inherent in the subject. Quantum physics still stands decidedly apart from pre-quantum physics. The older physics is, so to speak, hinged to it in many places, but no one yet feels sure of the essential link. There is, for example, no crucial connecting experiment yet recognised. The fundamental equations of quantum theory, which shall include the equations of classical physics, still remain to be formulated. Probably the most significant fact established is the dual wave—particle aspect of atomic entities, but whether the statistical interpretation of quantum laws is essential, or cloaks something simpler, remains to be decided. Again, in this section, issues are stated fairly, and in an understandable way, and the authors make many interesting observations.

The printing, figures and index leave nothing to be desired, and the book can be recommended on all counts without reservation. Later volumes of this series will be looked for with interest.

Chemistry for Engineering Students, by R. HUM. (Pp. 832). London: Griffin & Co. Price 15s.

Why is it that so many engineering students—particularly electrical—take so unkindly to chemistry Many reasons could be given, among which laziness would occupy no mean place. Nevertheless, it is safe to say that many of the more intelligent engineering students would dislike the subject less if it were taught differently. The mode of approach for engineers should not be the same as for chemists. As the author well puts it, for the engineer substances should be dealt with as a means to an end rather than as a final study in themselves. It is mainly along these lines that this book has been written, though the importance of chemical theory and of examinations prevent the ideal being fully carried out. Possibly it is well not to press the ideal for engineers too far, lest fundamentals are lost sight of.

As an indication of the author's efforts to treat of matters important for engineers, a few chapter headings may be quoted at random: Combustion of Fuel, Rusting of Iron . . .; Water, Steam, Ice, Solubility, Crystals; Coal, Graphite, other forms of Carbon, Carbon Dioxide; Characteristics of Metals . . .; Expansion and Solubility of Gases; Producer Gas, Carbon Monoxide, Analysis of Flue Gas; Fixation of Nitrogen, Coal Gas, Flames, Liquefaction and Refrigeration; Electric Cells; Corrosion and Protection of Metals, Electroplating . . .; Manufacture of Iron and Steel, Structure of Steel . . .; Lead, Tin, Accumulators; Hardness of Water; Silicon Compounds, Refractories; Electric Furnace Products; Organic Chemistry; Abrasives.

This list has gone further than we intended, but no further proof of the contents is needed. Given a sympathetic lecturer and this textbook, the subject of chemistry, like the subject of mathematics, will come to be regarded by many students as an interesting means to a valuable end.

Shorter Notices

"Science and Life," by J. G. Crowther. (Pp. 95.) London: Victor Gollancz, Ltd. 1s. paper, 1s. 6d. cloth.—A considerable amount of information is crowded into a small compass in this little book which, as its title implies, is a popular account of the application of science of all kinds to human welfare. The political and sociological leanings of the author are not concealed, but his terse summaries of scientific developments appear to be accurate and well suited to the public for which he writes. A defect is the lack of an index, particularly in view of the wide range of subjects dealt with.

"Pitman's Handbook of Commercial and Technical Education." (Pp. 590.) Price 15s., deals with education in all subjects and includes particulars of the various associations and institutes, the qualifications necessary for membership, fees, &c. Details are given regarding the I.E.E., E.C.A. and E.A.W. among many others. There are also signed articles on the various aspects of education and a list of directors of education throughout the country.

"The Welding Engineer's Pocket Book." (Pp. 207; illus.) London: Newnes, Ltd. Price 3s. 6d.—Practical information on the various phases of welding in a condensed form, explanatory diagrams being used in a large number of instances. Tables are included giving properties and weights, &c., of metals and other data likely to be useful to the practical welder.

"Electrical Technology," by H. Cotton. Third edition. (Pp. 523; figs. 423.) Price 12s. 6d. "Problems in Radio Engineering," by E. T. A. Rapson. (Pp. 117; illus.). Price 3s. 6d. London: Sir Isaac Pitman & Sons, Ltd.

"A Complete System of Bookkeeping for Electricity Supply Authorities," by J. Hindman. (Pp. 135.) London: Gee & Co. Price 8s. 6d.

"Der Schutzbereich von Blitzableitern," by A. Schwaiger. (Pp. 115, illus.) Price RM. 5. "Transformatoren mit Stufenregelung unter Last," by K. Boelte & R. Kuechler. (Pp. 180; figs. 159.) Price RM. 9.60. Munich: Verlag R. Oldenberg.

"Electron Optics in Television," by I. G. Maloff and D. W. Epstein. (Pp. 298; illus.) London: McGraw Hill Publishing Co. Price 21s.

"Elementary Mathematics for Electrical Engineers," by Sir Ambrose Fleming. (Pp. 110; illus.) London: G. Newnes. Price 5s.

All-electric House Costs.

By T. W. Barrett

Experience in a small Ilford house

IN view of arguments for and against the all-electric house, my own experience may be of interest, particularly with regard to costs, which incidentally I wished to keep as low as possible. Choosing a house on a new estate before the construction had proceeded beyond the damp course, I thus received full credit for all parts not required.

The builder's specification comprised two reception rooms, hall, kitchenette, three bedrooms, bathroom and w.c. The reception rooms and front bedroom were fitted with open fireplaces with tiled surrounds and gas points. The dining-room fireplace also had a fireback boiler to supply hot water to the kitchen and bathroom, the storage tank for this being fitted (unlagged) in a cupboard in the second bedroom. Equipment for the kitchen included a gas wash-boiler and either a gas or electric cooker. The second bedroom was fitted with a 1-kW panel fire and a gas point, while the third bedroom had a 15-A switch plug only.

I decided to do away with all gas carcasing, the existing hot water system, the fireplaces and flues in the dining-room and front bedroom, and the dividing wall between the first and third bedrooms. The fireplace in the sitting room was not disturbed owing to my wife's insisting on one open fireplace. In place of these items I arranged to have the following extras:—Sitting room, one 15-A and one 2-A switch-plug and a 2-A plug for a clock (to be wired back direct to the supply entry); dining room, 2-kW panel fire and a 2-A switch-plug; kitchen, 1-kW 12-gal. "Sadia" storage water heater and a 3-kW 10-gal. wash-boiler; first and third bedrooms, 2-kW panel fires (using the existing feed to the 15-A switch-plug in the third bedroom) and 5-A switch-plugs. A detailed list of extras and credits is given below.

By making his house practically all-electric the author of this article has not only rendered it easier to run and keep clean but claims to have reduced his fuel costs by almost half.

EXTRAS AND CREDITS

	Extra. £ s. d.	Credit. £ s. d.
Dining-room:—		
2-A switch plug	17 6	—
2-kW fire in lieu of tiled surround	—	—
Sitting-room:—		
Plug for clock	15 0	—
2-A switch plug	17 6	—
15-A ditto	1 15 0	—
Kitchen:—		
12-gal. "Sadia" water heater, plumbing and wiring	13 10 0	—
3-kW wash boiler with wiring	3 15 0	—
Gas wash boiler	—	12 6
Bedrooms:—		
Omit dividing wall	—	1 10 0
Omit tiled surround to fireplace	—	1 5 0
2-kW panel fire	1 10 0	—
5-A switch plug	17 6	—
General:—		
Omit fire-back boiler and fireplace in dining-room and also entire hot water system	—	5 0 0
Omit all gas carcasing	—	2 10 0
Omit flues not required	—	10 0 0
Crabtree accessories in white bakelite throughout	1 15 0	—
TOTALS	£25 2 6	£20 17 6
Net extra cost	£4 5 0	
BUILDER'S PRICE FOR STANDARD HOUSES	£590 0 0	

The space formerly occupied by the fireplace in the first bedroom has been enlarged into a built-in wardrobe. In the second bedroom the cupboard where the hot-water tank was originally fitted is now used as a wardrobe. The water heater has been fitted in the kitchen to give the shortest possible pipe-runs to the sink, bath and wash basin. Lagging these runs was not considered necessary in view of their shortness and low heat losses. When fitted, the thermostat was set at 170 deg. F., but I have since altered this to 155 deg. F., which I find is adequate for all purposes.

Before taking possession of the house, my wife had not had much experience of cooking and was not biased in favour of any particular method. She very soon became accustomed to the Hotpoint "501-T" hired from the Ilford Electricity Department, and considers it to be very easy to manage, although she admits that she does not use it as a demonstrator would. A Bulpitt 3-pint, 1-kW kettle used in conjunction with the cooker takes about ten minutes to boil from cold, although it is nearly always filled from the hot tap. A 1-kW portable fire warms the kitchen during the winter. An electric blanket (loaded at 50 W) switched on about two hours before going to bed costs only about half as much to use as a hot-water bottle, besides warming a much larger area.

I do not claim that my house is 100 per cent. electric, but merely as labour-saving as I have been able to make it without adding too much to the cost. There are, of course, a number of other appliances which I hope to install later to make my wife's duties lighter. My connected load at present is 17.4 kW made up as follows: Cooker, 4.9 kW; wash boiler, 3 kW; water heater 1 kW; fires, 6 kW; kettle, 1 kW; iron, ½ kW; and lighting, radio, blanket and clock about 1 kW.

During the two years I have been in occupation a total of 8,974 kWh has been consumed, at a cost for the first fifteen months (consumption 5,049 kWh) of ½d. per kWh, and for the latter nine months (3,925 kWh) of ¼d. per kWh, plus an annual standing charge of £1 18s. (10 per cent. of the rateable value). The total cost of electricity has thus been £19 17s. 5½d. To this must be added £1 17s., the cost of coal and firewood used in the sitting-room fire, giving a total fuel cost of £21 14s. 5½d. for the two years, an average of just under 4s. 4½d. per week.

Owing to prejudice I have not been able to obtain exact figures from my neighbours, but I understand that they average about 1s. per week for electricity for lighting at 3½d. per kWh, 3s. 6d. per week for gas, and between 2s. 6d. per week in the summer and 7s. 6d. per week in the winter for coal, say an average of 4s. per week. This gives a total fuel cost of about 8s. 6d. per week, nearly double my figure, with a great deal more inconvenience and dirt, not to mention being roasted in the dining room during the summer months if a hot bath is desired.

During the two years under review the house has been occupied at all times by my wife and myself. I am out all day, and we have a hot meal in the evening. My wife usually cooks herself a light lunch. All laundry is done at home and several baths are taken each week.

In the Courts

Ethiopian Radio-telegraph Service

The Court of Appeal on June 30th delivered judgment in the appeal of Hailé Selassie from the judgment of Mr. Justice Bennett in the Chancery Division dismissing his claim against Cable & Wireless, Ltd., for £10,613 which he alleged was due under an agreement for a radio-telegraph service between Addis Ababa (Ethiopia) and Great Britain.

The company did not deny that the money was due to whichever was the sovereign power in Ethiopia and which the Italian Government claimed to be.

Mr. Justice Bennett held that he had no jurisdiction to decide what the rights of Hailé Selassie were, in the events which had happened, and made an order staying all further proceedings in the action, and from this decision Hailé Selassie now appealed.

The Master of the Rolls, who delivered the judgment of the Court, said that the substantial defence to the action was that by reason of the conquest of Ethiopia by the Italians, coupled with the recognition of the King of Italy by this country as the *de facto* sovereign of Ethiopia, the right to recover the money had become vested in the King of Italy.

The opinion of the Court was that the decision of Mr. Justice Bennett could not be supported, there being no rule of law that deprived Hailé Selassie of his right to make his claim here. The appeal would be allowed and the action remitted to the Chancery Division for hearing. The Master of the Rolls referred in his judgment to the appellant as "His Majesty Hailé Selassie the First, Emperor of Ethiopia."

Brush Scheme Sanctioned

In the Chancery Division on July 4th Mr. Justice Simonds had before him a petition by the Brush Electrical Engineering Co., Ltd., for the sanction of the Court to a scheme of arrangement and for the confirmation of a reduction of its capital from £600,000 to £233,604.

Mr. Lindon said the scheme provided for an arrangement between the two classes of debenture holders and the ordinary stockholders. The scheme was devised with a view to providing further working capital to enable the company to deal with its creditors and bankers and put the finances of the company on a better basis. By the reduction it was proposed to write off 75 per cent. of the ordinary stock. It was true that the company had sustained considerable losses but the petition was not based upon that. It was to meet the view of those prepared to put up further capital. The company's position had now improved and it needed the funds to carry on the development of its objects.

His Lordship observed that the scheme was very complicated but admirably worked out. He sanctioned the scheme and the reduction of capital.

The Royal Show

Great interest shown in the all-electric farm

WITHOUT doubt the exhibit that is attracting the most attention at the Royal Agricultural Society's Show being held this week at Cardiff is the complete self-contained electric farm arranged by the South Wales and Monmouthshire Area Committee of the British Electrical Development Association. This is far and away the most ambitious display of the applications of electricity on the farm ever arranged by E.D.A. and it covers an area of no less than 24,000 sq. ft. divided by a wide flower-bordered drive into two roughly equal sections, one comprising the domestic farm buildings and the other the stockyard, cowsheds, poultry houses, etc.

Approaching the farmhouse one first passes a greenhouse equipped with electric heaters, plant irradiators, &c.; garden frames with thermostatically controlled soil heaters; and a farm workshop provided with such electric apparatus as circular saws, log saws, drills, &c. In the garden are an electrically operated fountain and an electric lawn mower, and old methods and new are strikingly contrasted by an old-fashioned well and dip bucket alongside a modern Beresford "Stork" electric lift pump.

The farmhouse itself is rendered as labour-saving as possible by the provision of complete electrical services in the way of cooking, water heating, refrigeration, vacuum cleaning, and clothes washing, drying and airing. Equipment in the bathroom includes, in addition to water heaters and drying cupboard, a wall radiator, hair dryer and curling-tong heater.

A sheep-shearing demonstration in progress on the E.D.A. electric farm

Several hundred chicks are being hatched out daily in the glass fronted incubators in the poultry section, where are also to be found examples of battery brooders, electrically heated hovers and fattening pens, laying batteries with an electric cleaning system, egg graders and poultry pluckers. For storing table birds there is a Frigidaire cold-room.

If possible, the display of the General Electric Co., Ltd., is this year even more comprehensive than usual and a new dairy sterilising chest with water heating and steam pressure jet is proving an especial centre of interest. Among its outstanding features are instantaneous and positive steam cut-off, an immediate hot water supply, protected elements, foolproof operation, maximum efficiency combined with minimum water consumption, easy accessibility to all parts, and all-metal construction.

Separate steam raisers are also on view and a display of plant manufactured by the associated concern, Coldair, Ltd., includes milk coolers, cold rooms, milk bars and ice-cream appliances. Witton motors for driving countershafting, G.E.C. trans-

The electric farm at the Royal Show is by far the most ambitious agricultural exhibit yet staged by E.D.A. It covers an area of 24,000 sq. ft.

portable "Skidmotors" and various power driven appliances represent another side of the company's activities, while sections of the stand are devoted to domestic, horticultural and poultry appliances.

Close to the G.E.C. stand is stationed the Brook Motors show van where visitors are having their attention drawn particularly to the requirements of the new Factories Act.

On practically every stand throughout the Show can be seen indications of the growing appreciation of the advantages of electricity in all branches of agricultural work, even for the less obvious applications such as hay loading, trussing and stacking, chaff cutting, potato sorting, and corn screening.

Electric milkers, of which we noticed examples on the stands of the International Harvester Co., R. J. Fullwood and Bland, Gascoigne, J. & R. Wallace, Alfa-Laval and Vaccar, are becoming almost universally adopted, and we were interested to see a portable open-air milking plant for 60-70 cows shown by Hosier Inventions.

Cooling milk in the churn is a new idea developed by Martins Cultivator Co., whose electrically operated plant reduces the temperature of milk in six cans to 40 deg. F. in 1¼ hours. Cooling equipment to meet all requirements is to be seen on the stands of Aveling-Barford, Perkins Clean Milk Equipment, the International Refrigerator Co. and Frigidaire. J. W. Woolley, Martin's and Aveling-Barford make a special feature of electric sterilisers and the last two companies also have electrically agitated pasteurisers.

Oil engines, generating and pumping plant are well represented by Petters, Ruston & Hornsby, John Fowler & Co. (Leeds), R. A. Lister, J. & H. McLaren, the Associated Manufacturers' Co. (London), Beatty Bros., Blackstone, H. J. Godwin and Thomas & Son (Worcester).

This is the third year that the catering has been all-electric and to provide the 3,000-4,000 meals required daily there have been installed seven roasting ovens, a pastry oven, hotplates, hot cupboards (all G.E.C. equipment), two water boilers and a stockpot (Burco). Electricity is also used exclusively in the dairy competition section and altogether the essential services take approximately 1,000 kW, exclusive of the 200 kW required for the electric farm.

Next to the farmhouse is an air-conditioned aviary, the heat and air circulation being electrically controlled.

The home dairy where the butter, cheese and other products are prepared for home consumption is equipped with a milk cooler, butter and cheese making apparatus and a cold room, and the opportunity is taken to compare two different types of lighting fittings. Demonstrations are also given of ice-cream making.

Extending the whole length of one side of the stockyard is a long barn which is liberally equipped with electrical machinery for coke breaking, root pulping, chaff cutting, corn grinding, &c., while above is a loft which enables an electric hoist to be demonstrated. In the barn also is accommodation for the electric vehicles which the farmer would use for his milk rounds and for journeys to and from the station and the market.

In the cattle sheds, which house a dozen or so cows, the most up-to-date type of Gascoigne electric milking plant is demonstrated, the milk being brought through pipes to the adjoining dairy, where all the cooling, bottling, bottle washing, sterilising and water heating equipment is electrical. The provision of loudspeakers in the sheds to calm the cattle if disturbed at night is one of the more recent applications of electricity, and special attention is drawn on hygienic grounds to the necessity for adequate lighting.

Large crowds have been gathering to witness sheep shearing by an expert who takes only about three or four minutes a sheep, or less if the sheep behaves well. The use of radiant heat in pig farrowing and in the whelping of hounds has also been creating a good deal of interest, as likewise has the Electro-Horticultural Equipment Co.'s sprout unit for producing continuous supplies of green fodder throughout the year.

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

Joint Authorities' Conference

At the Conference of Joint Electricity Authorities, Joint Electricity Advisory Boards, and Joint Electricity Committees held recently at Turnberry, Ayrshire, delegates discussed the Coal Bill in regard to the protection of public utility undertakings and other users of coal. Consideration is to be given to the Bill by the conference when the Lords' amendments come before the House of Commons. Regarding the Hire-Purchase Bill, 1938, it was stated that efforts would be made in the House of Lords to amend the Bill in favour of the exclusion of public authorities from its operations. The question of compulsory wiring regulations and registration was referred to the Executive Committee for consideration. The meeting approved the annual report for the year ended June 30th. It stated that the conference had expressed the opinion to the National Committee appointed to examine in detail the question of precautions for electricity undertakings against hostile air raids, that where schemes of air-raid precautions prepared by electricity undertakings and approved by the Electricity Commissioners related to the protection of works of national importance, the Government should bear at least 90 per cent. of the cost of such measures, or not less than the proportion of cost which the Government had agreed to refund to local authorities in respect of their schemes of air-raid precautions.

A group at the B.T.H. Parents' Day, showing Sir John and Lady Chancellor, Mr. T. Hands (manager, Willesden), Mr. A. P. Young (manager, Rugby), together with prizewinning apprentices, vice-presidents of the B.T.H. Willesden Apprentice Association, and representatives of leading technical schools

Exhibition Showcase Lighting

An excellent opportunity to demonstrate modern technique in showcase lighting has been provided by the Exhibition of Modern Silverware which, until the end of next week, is being held at the Goldsmiths' Hall, Foster Lane, London, E.C.4. To provide a soft, general illumination the ceiling is floodlighted by Benjamin "Type S.4579" reflectors containing a 500-W lamp each, while most of the showcases are lighted through muslin or satin frosted glass by means of ordinary 40 or 60-W lamps in artificial daylight reflectors. Combined with attractive backgrounds of patterned cloth or corrugated board, this arrangement is extraordinarily effective and brings out the detail of the goods displayed with exceptional clarity. The soft white light obtained approximates closely to daylight and its intensity is claimed to be nearly double that of daylight lamps of equal wattage. Tubular lamps have been employed to good advantage in five semi-circular alcoves which show in their appropriate settings specimens of silverware for the dressing table, nursery, lounge, &c. The display lighting was designed and carried out by H. M. Walters & Co., the main wiring contractors being Belshaw & Co., Ltd.

Industrial Safety

Prizes amounting to £100 are being offered to amateur film makers by the National "Safety First" Association for silent 16-mm. films illustrating how exemplary or foolish conduct can prevent or cause accidents in industry and on the roads. The prize-winning efforts will be used in the Association's lecture campaign.

New C.M.A. Member

The Cable Makers' Association announces that the Metropolitan Electric Cable & Construction Co., Ltd., has become a member of the Association.

Wellingborough Chamber of Trade Exhibition

Electrical appliances were prominent among exhibits at the fifth annual exhibition and gala, arranged by Wellingborough Chamber of Trade, held at Bassett's Close, Wellingborough, on June 30th. The Wellingborough Electric Supply Co., Ltd., had three stands, a comprehensive range of domestic appliances being shown. Electric cooking and washing demonstrations were given, and the use of refrigerators demonstrated.

B.T.H. Parents' Day

The Willesden works of the British Thomson-Houston Co. were again "at home" to over 400 visitors on the occasion of the annual parents' day on July 2nd. After concluding a tour of the works and witnessing many interesting demonstrations, including the disruption of a piece of wood under impulse discharge, the visitors were entertained to tea and formally welcomed by Mr. T. Hands (manager), who introduced the principal speaker, Sir John Chancellor and Lady Chancellor. The object of the essay competition having been explained by Mr. H. Trencham (consulting switchgear engineer), Sir John Chancellor presented the certificates and the Easthope medal to the successful entrants. Mr. Hands mentioned a new departure, the apprentice shield, presented by Sir Felix Pole, for the apprentice who, in the opinion of his fellows, had shown the most distinguished public spirit, and the object of the shield and the method of its award were explained by Mr. I. H. Child (chairman, Apprentice Association). Lady Chancellor then presented the shield. In his address to the visitors Sir John Chancellor (who is a director of Associated Electrical Industries, Ltd.) said that it was not possible for any parent to attend this function and fail to be impressed by the completeness of the training given and the arrangements made for the apprentices' welfare. Mr. A. P. Young (manager, B.T.H., Rugby) paid tribute to the essay competitors, and proposed a vote of thanks to Sir John Chancellor, which was seconded by Mr. D. Jessel (secretary, Apprentice Association), while a vote of thanks to Mr. Hands was proposed by a parent and seconded by Mr. Griffiths (Principal of the Wandsworth Technical Institute), who spoke on co-operation between manufacturers and technical schools in relation to apprenticeship training. Mr. F. A. Parker (apprentice supervisor) spoke of the results of the drawing office examination, and drew attention to two further exhibits meriting attention, one being fluorescent lighting phenomena arranged by B.T.H. lighting engineers, and the other an exhibition of domestic apparatus arranged and demonstrated by the Hotpoint Co., Ltd.

Stafford Pageant and Carnival

A feature of the recent Stafford Infirmary Pageant and Carnival was a decorated lorry entered by the English Electric Co., Ltd. This tableau, which was awarded the challenge cup, displayed the company's cookers fitted with "Ritemp" automatic oven control.

A prize-winning entry by the English Electric Co., Ltd., in the Stafford Pageant and Carnival

Employment in May

Employment in the engineering industry in May showed a slight decline in all the principal sections, but was still very good in electrical engineering. According to the *Ministry of Labour Gazette*, the number of unemployed in the engineering industry was 82,521, an increase of 5,512 on the month and 30,580 as compared with May, 1937. The percentage unemployed was 7.0, against 6.6 in April and 5.0 in May, 1937. In the electrical engineering industry the number out of work totalled 6,079, or 5.3 per cent., against 5.1 per cent. in April and 3.0 per cent. in May, 1937. The unemployed in the electrical wiring and contracting industry numbered 4,433, or 10.8 per cent., against 10.6 per cent. in April and 10.0 per cent. a year ago. In the cables, apparatus, lamps, &c., group there was a slight improvement on the month, the total of 16,022 representing a percentage of 9.0 against 9.3 in April and 5.1 in May, 1937.

Meters Approved

The *London Gazette* for June 24th contains a further list of electricity meters approved by the Electricity Commissioners, manufactured by the following concerns:—A.E.G. Electric Co., Ltd.; Aron Electricity Meter, Ltd.; British Insulated Cables, Ltd.; British Sangamo Co., Ltd.; Chamberlain and Hookham, Ltd.; Electrical Apparatus Co., Ltd.; Ferranti, Ltd.; Robert Hornby & Co., Ltd.; Landis & Gyr, Ltd.; Measurement, Ltd.; Metropolitan-Vickers Electrical Co., Ltd.; and Rex Meters, Ltd.

Social Events

Among the outstanding events at the annual sports of W. T. Henley's Telegraph Works Co., Ltd. (Gravesend), held on July 2nd, was the winning by the head office team for the second year in succession of the W. F. Bishop relay cup. Bad weather marred the opening, but in spite of a storm some good performances were recorded. P. Connolly threw the cricket ball 104 yd., and in addition shared the works cup with C. Atkinson for the greatest number of points scored. Atkinson won the mile handicap in fine style. Among the numerous sideshows and amusements was an ankle competition won by Rene Whitehead. Sir Montague Hughman opened the rifle shooting competition, at which several of Henley's directors showed excellent marksmanship. At the conclusion of the sports prizes were presented by Lady Crowe, and the sports pavilion was crowded with dancers until 11 p.m. Bert Couzens, a motor attendant at the company's North Woolwich works, walked from North Woolwich to Cambridge and back on Friday and Saturday last. On his return he walked to the company's sports ground, where Sir Montague Hughman presented him with a walnut timepiece subscribed for by colleagues at the North Woolwich works.

On June 25th the Simplex Electric Co.'s Social Club held its annual works' outing. Five hundred members from the Credenda works of the company visited Blackpool, while two hundred members from the Simplex works spent a day touring by motor coach. During the journey to Blackpool every member received a cash gift from the directors and a draw was made for forty prizes provided by the Social Club. The party from the Simplex works went from Birmingham to Abingdon by motor coach and thence by river to Wallingford for lunch. From Wallingford they went by coach to Woodstock, where sports were held and prizes were competed for.

On Saturday last the pavilion extension of the Standard Telephones & Cables Athletic and Social Club at the company's sports ground, Eltham, S.E., was formally opened by Councillor P. H. Rance, J.P., Mayor of Woolwich. As Councillor Rance is also an employé of Standard Telephones & Cables, Ltd., the event was of added interest. Our picture shows Councillor Rance performing the opening ceremony, with Mrs. Rance and various officials.

The official opening of the pavilion extension at the Eltham sports ground of Standard Telephones and Cables, Ltd.

The employés of Santon, Ltd., Newport, Mon., held their annual outing at Coney Beach, Porthcawl, on July 2nd. Lunch and tea were taken at Coney Beach Restaurant, some of the directors and their wives joining the party at lunch, including Mr. H. C. Sanders and Mrs. Sanders, Mr. R. C. Taylor and Mrs. Taylor, Mr. K. Taylor and Mrs. Taylor (senior). Mr. and Mrs. C. W. Buckley, Mr. and Mrs. Woodburn, and Mrs. Fulton sent apologies for unavoidable absence.

The annual excursion of employés of the Saxonia Electrical Wire Co., Ltd., was held on June 25th, when the party travelled by motor coaches to Southsea. Tea was served at the Castle House Tea Rooms. The managing directors, Mr. L. H. Euler and Mr. R. F. Bruce, were unavoidably prevented from attending, and telegrams of appreciation of the day's outing were sent to them.

As a result of recent matches the leaders of the various divisions of the Electricity Supply Rifle League are as follows:—Division 1: Shoreditch. Division 2: City "B." Division 3: London J.E.A. Division 4: Gravesend.

Qualifying for Rebate

A power factor of 0.95 lagging which qualified for the rebate on the cost of electricity granted by the Corporation was obtained by installing five auto-synchronous motors in such a way as to ensure that there is always sufficient correction no matter which machines are running. This is one of the features of a recent change-over carried out by Crompton Parkinson, Ltd., at the Birmingham factory of a well-known chocolate manufacturing concern. The main incoming supply at 11,000 V is taken through a fixed-type steel-clad cubicle, and distributed through three "T.A.P." units to two 400-kVA and one 100-kVA transformers. The low voltage distribution is by

High-voltage switchgear at a Birmingham chocolate factory, comprising a main incoming switch (rupturing capacity 100,000 kVA) feeding a bank of three Crompton "T.A.P." units

means of four "Klad" units built to form a complete switchboard, two of these units being of 200 A capacity and two of 800 A capacity. The smaller distribution feeders are taken off through English Electric Co.'s high rupturing capacity fuse-gear. Among several drives the refiners have two 35-h.p. C.P. auto-synchronous motors running at 0.75 leading power factor, mounted on top of the machines with short "Texrope" drives. There is also a 40-h.p. a.s. motor in this section, while the compressors are driven by two 28-h.p. a.s. motors at 0.75 leading p.f., which are directly coupled and automatically controlled by temperature relay. Slip-ring machines rated at 12½ h.p. at 710 r.p.m. drive the chocolate mixers by "Texrope" on to an underground shaft. A 12½-h.p. s.r. motor and a ½-h.p. d.c. motor drive a sugar refiner, the d.c. motor being a variable speed type. On the storage tanks are 1-h.p., 710-r.p.m., squirrel-cage motors ultilised for agitating chocolate, a V-flat drive being used.

N.S.W. Electrical Manufacturers' Association

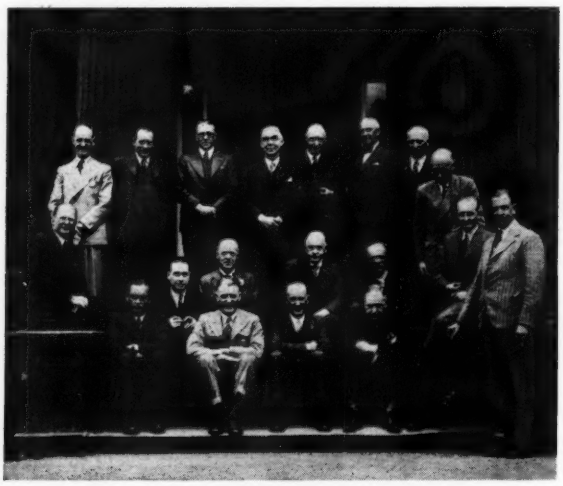
The *Electrical Engineer and Merchandiser* reports that at the annual meeting in May of the N.S.W. Electrical Manufacturers' Association Mr. H. Eaton Taplin (chairman) stated that despite the international tension and rising cost of raw materials and labour, local manufacturers improved their productive capacity in several branches of electrical manufacture. Employment reached a new high level and comparative figures showed that the number employed (male and female) rose from 4,799 in 1936 to 5,387 in 1937, and the value of raw materials treated (mostly Australian) increased from £1,268,560 in 1936 to £1,406,308 in 1937. Imports of some of the principal lines of electrical equipment such as switchgear and transformers, operating at voltages under 66,000, continued to increase and were 15 per cent. over the previous year's figures. The export trade (principally to New Zealand), on the other hand, showed a slight reduction. The New Zealand Government had introduced new rates of duty on Australian equipment which were higher than those applicable on imports from other British Dominions. Among the items, for example, were switches, wall plugs and sockets, table and reading lamps, storage batteries, electric irons and electric cooking and heating appliances. During the year representations were made to the Customs Department to protect local manufacturers of oil circuit-breakers with the object of ensuring that importers should furnish evidence that circuit-breakers complied with the rating stated thereon.

A New French Combine

Five of the largest electrical engineering concerns in France, *viz.*, the Société Générale de Constructions Electriques et Mécaniques Alsthom, La Compagnie Electro-Mécanique, La Compagnie Générale d'Electricité, La Société des Forges et Ateliers de Constructions Electriques de Jeumont and La Société Le Matériel Electrique Schneider-Westinghouse, have recently combined to form a new concern to be known as the Office de Gros Matériel Electrique, the object of which is "to control administratively and financially the agreements relating to the organisation of the market for heavy electrical plant."

The Highland Show

This year the Highland Show, the outstanding annual agricultural event in Scotland, was held in Dumfries from June 21st to 24th, and the Electrical Development Association had its usual stand displaying domestic and agricultural equipment. The Scottish Area Committee of E.D.A. held its monthly meeting in the offices of the Dumfries County Council Electricity Department and afterwards visited the Show. The accompanying picture shows the members of the Committee photographed at the entrance to the offices at Marchmount, and includes, back row, left to right: Messrs. E. M. Hood (E.D.A. Officer), D. Ross (Dumfries County), A. E. Roots (Dumfries Burgh), D. McDougall (Greenock), and local authority representatives. Middle row: Messrs. A. Hulme (Wigtownshire Co.), Bailie Gardner (Edinburgh), E. Seddon (Edinburgh), Bailie Hurry (Greenock), W. J. Cooper (Hamilton). Front row: Messrs. E. T. Pound (North Berwick) G. V. Vaughan (Kirkcudbright County), J. S. Pickles (Dumfries County), T. M. Climie (Falkirk), chairman, H. C. Babb (Lothians Power Co.), A. Logan (Dunoon Co.), W. D. Brassington (Motherwell).



Members of the E.D.A. Scottish Area Committee who attended the recent Highland Show

Trade Announcements

Siemens Electric Lamps & Supplies, Ltd., has removed its Belfast offices and stores to 41, Queen Street, Belfast. The new premises will enable more comprehensive stocks to be dealt with, and will include a showroom for the display of modern lighting fittings, domestic electrical appliances, industrial electrical material, &c. The telephone number and telegraphic address are unchanged.

Although Tubelite Sales, Ltd., have gone into liquidation, Maple & Co., Ltd., are still carrying out the manufacture of "Barlux" tubelamps, and in addition all sales formerly handled by Tubelite Sales will be dealt with by them. The personnel remains as before, and Mr. J. A. Stewart, formerly manager of Tubelite Sales, has joined Maple & Co., and is in charge of this section of their business. The address remains at 24, Euston Buildings, Gower Street, N.W.1 (telephone: 1403-4).

Oliver Pell Control, Ltd., has removed to Cambridge Row, Burrage Road, Woolwich, S.E.18.

James Hill & Son, electrical contractors, have removed their Manchester offices to 22, Lytham Road, Manchester, 19 (telephone: Rusholme 1522).

Mica Elements (1937), Ltd., has removed to Lotus Works, 42, Heigham Road, East Ham, E.6.

Robert H. Kulka, Ltd., Shell-Mex House, Strand, London, W.C.2, have been appointed the sole agents and distributors for the B.E.N. range of air compressors, spray paint plant and garage equipment, for the whole of Latin America.

The General Electric Co., Ltd., have been appointed sole distributors to the electrical and radio trades of the "Philplug" plastic wall plug. In addition to this line the G.E.C. is handling "Philbolt" patent anchor bolts and "Philplug" jumpers and wall drills.

The Wego Condenser Co., Ltd., has appointed Bonar, Long & Co., Ltd., Princes Street, Dundee, as its representatives for the whole of Scotland.

New Electricity Showrooms at Conway

Conway Corporation's new electricity showrooms at Llandudno Junction, which were officially opened on July 1st, by the Mayor of Conway (Councillor J. T. Jones), occupy a commanding corner site and have cost £4,500 to build and equip. Accommodation is provided for all the departmental stores, including cables and all the smaller stores for constructional work. A spacious part of the building is devoted to a showroom for the demonstration of all kinds of electrical equipment. Above the first floor are additional showrooms and a room where lectures and demonstrations will be given. The flanking portion of the building includes the offices of the borough electrical engineer (Mr. W. H. Hancock), together with a record office, a general office for the payment of accounts, and a staff room. Electricity supply in Conway is received in bulk from the North Wales Power Co., Ltd.

Electrical Wholesalers Amalgamate

An amalgamation has taken place between Alliance Wholesale, Ltd., of 62, Gt. Russell Street, W.C.1, and Luton, and the Surrey Wholesale Electrical Co., Ltd., Croydon. As from July 1st the amalgamated businesses will be carried on under the title of Alliance & Surrey Wholesale, Ltd. For the purpose of this amalgamation the Surrey Wholesale Electrical Co., Ltd., has been placed in members' voluntary winding-up, and all liabilities will be discharged by Alliance & Surrey Wholesale, Ltd. Mr. H. J. Grant and Mr. F. D. Pratt, respective managing directors of the amalgamating concerns, will be joint managing directors of the continuing company, and the board will be completed by Mr. A. E. Sharman as director. Continuity of management is fully preserved.

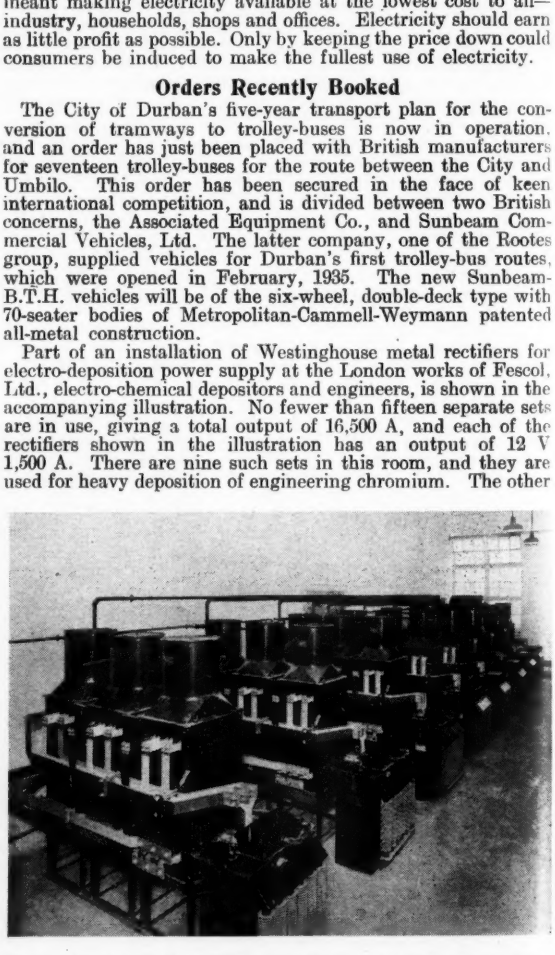
Electric Hall, Worksop

The Worksop Corporation's latest enterprise, an "Electric Hall," was formally opened recently by Mr. J. M. Kennedy, vice-chairman of the Electricity Commissioners, and among those attending was Lady Anne Cavendish, president of the Worksop branch of the E.A.W. Ald. H. Hartland, chairman of the Electricity Committee, who presided, said it was partly on account of the excellent work of the women's organisation that the need for the Hall had arisen. Mr. Kennedy, declaring the Hall open, remarked that success in the Department did not mean a fat revenue balance at the end of the year; it meant making electricity available at the lowest cost to all—industry, households, shops and offices. Electricity should earn as little profit as possible. Only by keeping the price down could consumers be induced to make the fullest use of electricity.

Orders Recently Booked

The City of Durban's five-year transport plan for the conversion of tramways to trolley-buses is now in operation, and an order has just been placed with British manufacturers for seventeen trolley-buses for the route between the City and Umbilo. This order has been secured in the face of keen international competition, and is divided between two British concerns, the Associated Equipment Co., and Sunbeam Commercial Vehicles, Ltd. The latter company, one of the Rootes group, supplied vehicles for Durban's first trolley-bus routes, which were opened in February, 1935. The new Sunbeam-B.T.H. vehicles will be of the six-wheel, double-deck type with 70-seater bodies of Metropolitan-Cammell-Weymann patented all-metal construction.

Part of an installation of Westinghouse metal rectifiers for electro-deposition power supply at the London works of Fescol, Ltd., electro-chemical depositors and engineers, is shown in the accompanying illustration. No fewer than fifteen separate sets are in use, giving a total output of 16,500 A, and each of the rectifiers shown in the illustration has an output of 12 V 1,500 A. There are nine such sets in this room, and they are used for heavy deposition of engineering chromium. The other rectifier equipments are situated in another room. All the rectifier sets are completely remote-controlled from the actual vats, the range of control on each of the nine 12-V 1,500-A equipments being from the maximum of 12 V in ten steps down



Westinghouse metal rectifiers installed at an electro-deposition works

to a minimum 4 V. No foundations were required when installing the rectifiers.

Allen West and Co., Ltd., have recently supplied one of their "OB" switchboards to Durban Corporation for its Cato Street sub-station. The switchboard, which has been designed to the approval of Merz & McLellan, will be installed on the Corporation's 6,600 V system, and is of the duplicate bus-bar, vertical draw-out, oil and compound filled design, with bus-bar selection on the "off-load" transfer breaker principle. The units embody circuit-breakers of 250,000 kVA rating, as certified by tests conducted by the British Short Circuit Testing Station, Ltd., in accordance with B.S. 116—1937. The board consists of twelve 600-A and two 1,600-A feeder equipments, together with a 1,600-A unit for front bus sectionalising. The 1,600-A feeder units are equipped for directional overcurrent and translay protection, four of the 600-A feeder units are provided with Merz-Price and overcurrent protection, and the remainder with overcurrent protection.

Electricity Supply Workers' Wages

An application from the unions connected with the electricity supply industry for an increase of 2½d. per hour for their members has been rejected by the Industrial Court. The unions asked last September for a rise of 3d. per hour and subsequently ¾d. per hour was granted by the N.J.I.C.

A Cinema Lighting Installation

The new Apollo Super Cinema, Ardwick Green, Manchester, is a Holophane colour-lighting installation which will contain a number of new and original stage lighting developments. This new stage design, which has been patented, has special splayed side walls to enable the stage operating staff to light and direct the show while concealed from the view of the audience, but clearly seeing from the front everything that occurs on the stage. The new angle will afford the players and the staff greater co-operation than has hitherto been possible from the back and sides. In conjunction with this new departure there will be a number of original methods of lighting. The artists will be illuminated by equipment concealed in the auditorium which replaces the traditional footlights, battens and perch arcs. Beams of light will be projected on to the stage acting area from magazines of lighting equipment concealed in special ceiling coves above the auditorium supplemented by spotlights mounted in new positions behind the diagonal splayed walls of the auditorium.

Glasgow Electrical Handbook

In connection with the Empire Exhibition, the Glasgow Corporation Electricity Department has issued a well-produced brochure describing and illustrating the progress and work of the Department and some of the many industries to which it supplies electricity. The Department also provides a supply for the Empire Exhibition, and the illustrations include pictures of some of the illuminations.

Works Visit

Delegates to the International Engineering Congress recently paid a visit to the works of Glenfield and Kennedy, Ltd., Kilmarnock. Ninety delegates to this Congress were included in the party; among them were engineers from the United States, France, Germany, Czecho-Slovakia, Greece, India and Japan. After a tour of the shops the party was entertained to lunch in a marquee erected at the works, during which the toast of "Glenfield and Kennedy, Ltd.," was proposed by Mr. D .E. Roberts, president of the Institution of Mechanical Engineers, and replied to by Mr. E. Bruce Ball, managing director. The occasion was also taken to declare officially open the new brass foundry and the extension to the main offices.

The annual summer outing of the Manchester Engineering Council took place on July 2nd, when over 400 members toured the Trafford Park works of the Metropolitan-Vickers Electrical Co. The occasion was the more interesting as this is the twenty-first year of the Council's existence. Tea was taken in the staff canteen, where the party was welcomed by Mr. G. E. Bailey, a director of the company and this year's president of the Council. Sir Frederick West, vice-president of the Council, responded. After tea the party proceeded to the Metrovick Club where bowls, tennis, and outdoor games and a concert were arranged.

Prices of Materials

Henry Gardner & Co., Ltd., report, July 6th: Copper bars (best selected), sheet and rod, £74, £2 increase. English pig lead, £17 5s., 15s. increase. Spelter, £14 8s. 9d., £1 3s. 9d. increase. English block tin, £194 5s., £9 increase. Mercury, no change.

Frederick Smith & Co., report, July 6th: Electrolytic copper bars, £43 5s., £1 increase. Ditto, ditto, wire rods, £47 15s., £1 increase. Ditto, ditto, h.c. wire, 7¾d., $\frac{3}{16}$d. increase. Silicium bronze wire, no change.

Edward Till & Co., report, July 6th: India rubber, Para fine, 7d., ½d. increase.

New Catalogues and Lists

Sturtevant Engineering Co., Ltd., 147, Queen Victoria Street, London, E.C.4.—An illustrated booklet dealing with pneumatic transmission tubes.

C.A.V.-Bosch, Ltd., Acton, London, W.3.—A spare parts list covering all low-voltage lighting and starting equipment.

Electrical Commodities, Ltd., Sparton Works, Beresford Avenue, Wembley.—A catalogue of "Samson" domestic electrical appliances which the company is about to place on the market.

Union Lamp & Lighting Co., Ltd., Union Lamp Works, Abbeydale Road, Wembley.—A price list of tubular opal candle lamps.

Switchgear & Cowans, Ltd., Old Trafford, Manchester.—A technical booklet dealing with non-automatic three-phase oil-immersed switches for ring mains, grouping and bus-bar sectionalising.

O. M. Seman, 108, Victoria Street, London, S.W.1.—Details of the "Little Friend" washing-up machine.

Mica Elements (1937), Ltd., 42, Heighan Road, East Ham, E.6.—A booklet dealing with electric heating elements of all kinds.

Griffiths Bros. & Co., Ltd., Bermondsey, London, S.E.16., have produced a booklet (pp. 24) dealing with the properties and use of insulating varnishes.

Higgs Motors, Ltd., Witton, Birmingham, 6.—Catalogue page additions dealing with slip-ring and s.c. induction motors and vertical spindle motors.

British Insulated Cables, Ltd., Prescot.—A leaflet describing a cross-over for trolley-bus lines.

L. G. Hawkins & Co., Ltd., 30-35, Drury Lane, London, W.C.2.—Sales leaflets relating to small domestic appliances and refrigerators.

Rhodes, Brydon & Youatt, Ltd., Waterloo Engineering Works, Gorsey Mount Street, Stockport.—A complete illustrated catalogue of "Mopump" electric pumping equipment.

English Electric Co., Ltd., Queen's House, Kingsway, London, W.C.2.—Full details of the new electrified Wellington to Paekakariki railway, New Zealand, and a pamphlet relating to all-insulated house service meters.

Pope's Electric Lamp Co., Ltd., 5, Earnshaw Street, New Oxford Street, London, W.C.2.—A price list of "Elasta" lamps.

Private Arrangement

D. Howell and **R. H. Holmes,** trading as D. Howell & Co., Finney Lane, Heald Green, Cheshire, radio dealers and electrical engineers, &c.—The creditors were called together on June 29th when a statement of affairs was submitted showing ranking liabilities of £505, and in addition there were fully secured creditors for £821, who held a charge on the property at the above address which, for the purposes of the statement of affairs, had been valued at the amount outstanding. The net assets were £259, leaving a deficiency of £247. The separate estate of D. Howell disclosed liabilities of £40, with fully secured creditors of £338, while the net assets were put down at £38, with a deficiency of £2. The separate estate of R. H. Holmes showed liabilities of £100, against assets of £1, or a deficiency of £99. An offer was submitted of a composition of 8s. in the £, payable over a period. The creditors decided that the debtors should be given fourteen days in which to come forward with an offer of at least 10s. in the £, payable over a period and satisfactorily guaranteed, failing which the estate should be administered under a deed of assignment with Mr. A. Yearsley, I.A., Manchester, as trustee, with a committee.

Company Liquidations

Radio Services (Porthcawl), Ltd., 17, John Street, Porthcawl.—The statutory meeting of creditors was held on July 1st at the offices of J. Wallace Williams & Co., 5, St. Andrews Crescent, Cardiff, when Mr. R. I. Francis, a director of the company, presided. A statement of affairs as at June 24th last was submitted which disclosed liabilities of £942, of which £786 was due to the trade and the balance of £155 to the bankers. In addition, there was a fully secured creditor for £28. The net assets were £239, leaving a deficiency, as regarded the creditors, of £703. The issued capital of the company was £504, and so far as the shareholders were concerned there was a deficiency of £1,207. The present position of the company was attributed to the fact that instalments due under hire-purchase agreements were not paid on the due dates, with the result that the company had to find money to pay to the finance companies. The shareholders had previously met and passed a resolution appointing Mr. J. Wallace Williams as liquidator of the company, and after discussing the position the creditors decided that the voluntary liquidation of the company should be continued with Mr. Williams as liquidator. A committee was elected.

Baker's Selhurst Radio, Ltd.—Winding up voluntarily. Liquidator, Mr. C. Latham, 185, High Holborn, W.C.1.

Llangefni Electric Light & Power Co., Ltd.—Meeting July 28th at 24, Church Street, Llangefni, Anglesey, to receive an account of the winding-up by the liquidator, Mr. W. Owen.

Wantage Electric Supply Co., Ltd.—Meeting August 3rd at Thames House, Millbank, S.W.1, to receive an account of the winding-up by the liquidator, Mr. E. J. Harrison.

Bindley's, Ltd.—Winding up voluntarily. Liquidator, Mr. T. C. Bindley, managing director and secretary of the company.

Efandem Co., Ltd.—Winding up voluntarily. Liquidator, Mr. J. W. Molineaux, 49, Queen Street, Wolverhampton.

Bankruptcy Proceedings

H. Mozer and **S. Mozer,** radio dealers, 111, High Street, Stoke Newington, N.16.—Order made June 3rd suspending discharge for four months until October 3rd, 1938.

E. Ramsey, electrical engineer, 8, Springfield Place, Hunslet Carr, Leeds.—Receiving order made June 24th on debtor's own petition. First meeting July 11th at 24, Bond Street, Leeds. Public examination July 26th at the County Court House, Albion Place, Leeds.

L. T. Wilson, radio and electrical engineer, 30, Yardley Road, Acocks Green, Birmingham, formerly trading at 563, Coventry Road, Small Heath, Birmingham.—Trustee, Mr. R. K. Clark, 159, Great Charles Street, Birmingham, Official Receiver, released June 16th.

G. W. Jump, electrical engineer, 143, Sussex Road, Southport.—Trustee, Mr. J. Allcorn, Government Buildings, Victoria Street, Liverpool, released June 20th.

R. M. Jones, radio dealer, 40, Lordship Lane, East Dulwich, S.E.22.—Last day for receiving proofs for dividend, July 18th. Trustee, Mr. H. H. Gaine, Carey Street, W.C.2, Official Receiver.

H. A. Simpson & E. Dyson (Simpsons), radio and electrical engineers, 18, Eastbank Street, Southport.—Last day for receiving proofs for dividend, July 15. Trustee, Mr. W. Lithgow, 413, Lord Street, Southport.

Electricity Supply

Lighting, Domestic, Power

Accrington.—STREET LIGHTING CONVERSION.—About six hundred street lamps have now been dealt with in the scheme for converting the lighting of side streets from gas to electricity. By the close of the year the whole of the streets will probably be lighted by electricity.

Barking.—MAINS.—The Electricity Committee has requested the County of London Electric Supply Co., Ltd., to install ducts from the boundary of the company's area of supply to the Upney sub-station, at a cost of £1,070.

Battle.—OVERHEAD LINE.—The Rural District Council is to urge the Central Electricity Board to find an alternative route for an overhead line which, according to present plans, will cross Burwash Common.

Billingham-on-Tees.—NEW STREET LIGHTING.—A street-lighting installation employing 400-W "Osira" mercury electric-discharge lamps has recently been put into commission. The installation, which consists of some 280 lamps housed in G.E.C. "Lewisham" lanterns suspended from steel columns, at a mounting height of 25 ft., with an average spacing of 180 ft., was carried out under the supervision of the construction department of the North-Eastern Electric Supply Co., Ltd.

Bradford.—NEW EQUIPMENT.—The city electrical engineer's scheme for the erection and equipment of a sub-station and district transforming station in Wilmer Road, Heaton, for traction and general supply purposes, and the laying of high voltage cables, including additional traction cables in Manningham Lane, Keighley Road, &c., for the conversion of the tramway system to Frizinghall and Heaton to trolley-bus operation has been recommended for approval by the Electricity Committee. The total estimated cost is £30,760.

Canada.—TORONTO COMMISSION'S REPORT.—The latest report of the Toronto Hydro-electric Power Commission reveals that in 1937 the sales for the first time passed the 1,000 million kWh mark. Actually, the total was 1,039.4 million kWh compared with 977.4 million kWh in the previous year, an increase of over 6 per cent.

Chesterfield.—LOAN.—The Electricity Committee has applied for sanction to borrow £10,000 for meters required during the next five years.

Dundee.—ELECTRIC LIGHTSHIP.—The Harbour Trust is to construct a new lightship which will have electric power throughout provided by Diesel engines and generators in triplicate. There will be a fog signal, radio beacon and radio-telephone equipment.

Durham.—ELECTRIC LIGHTING IN SCHOOLS.—The Board of Education has sanctioned the installation of electric lighting in the Cassop, Craghead Mixed, New Silksworth, and Seaham Harbour, Viceroy Street, schools.

Eastbourne.—EXTENSIONS.—Mains extensions are to be carried out by the Electricity Committee at a cost of £614 to supply an estate of 62 houses being erected at Polegate.

Epsom.—The London County Council is to renew the main cable system and wiring at the Long Grove Hospital at a cost of £21,630.

Eston.—ELECTRIC COOKING IN SCHOOLS.—Following an inquiry received from the headmaster of the Sir William Worsley School the Electricity Committee is to ascertain the views of the North Riding Education Committee on the question of the provision of domestic electrical appliances in senior schools generally.

France.—ELECTRICAL SUBSIDY.—A decree law under which the electrical industry will receive a subsidy of about 200 million fr. per year has been promulgated by the French Government. The preamble explains that the annual consumption has reached about 18,000 million kWh, while capacity, not including old and uneconomic thermal plants, is only 20,000 million kWh. The plants at present under construction on the Rhone and elsewhere are sufficient for immediate requirements, but further construction to the extent of about 3,000 million fr. within the next year and 14,000 million fr. within eight years is necessary. Each project before being acceptable for subsidy must be approved by the Ministry of Public Works both as to its economic character from an electrical standpoint and as to its national importance. The subsidies cover both generating plant and transmission line construction, and are expected to provide a considerable impetus to electrical construction work in France where it has, in the past few years, been a little neglected.

MEDITERRANEAN COAST PROGRESS.—The report of the Energie Electrique du Littoral Mediterranean provides an optimistic note in the general concert of complaints as to the situation of the industry. Although the report states that salary increases and the general rise in the cost of all materials bought provided an additional burden, it points out that this has been more than overcome by the favourable development of business. The weather in the region has also provided sufficient water to operate the power plants normally. The improvement in consumption has been chiefly due to domestic development, the report states. The company controls a number of undertakings supplying nearly the whole of the Mediterranean coast from Italy to Marseilles, so that the report is looked upon with considerable interest by the industry.

Gateshead.—POWER PLANT AT INSTITUTION.—At a special meeting the Town Council decided to adhere to its previous decision to continue to generate electricity for the Teams Institution at its own plant and to carry out extensions to the plant. An amendment that the terms of the North-Eastern Electric Supply Co., Ltd., for supplying the Institution should be accepted was defeated by eighteen votes to four.

Kettering.—NEW REPAIR SHOP.—A tender has been accepted for the erection of a repair shop and meter testing room for the Electricity Department, as a cost of £1,449.

DOMESTIC SALESMANSHIP.—The Urban District Council has agreed in principle to a suggestion by the electrical engineer that the E.D.A. course in domestic electrical salesmanship should be open to any members of the staff or workmen of the Electricity Department approved by him. Where a candidate is successful in obtaining the diploma on completion of the course the Council is to refund the fees and give a gratuity.

Italy.—NEW SUBMARINE CABLE.—Work is in progress on the laying of a new submarine cable between Italy and Tripoli.

HYDRO-ELECTRIC WORKS.—Proposals are under consideration for the regulation and damming of the river Isonzo so as to be able to produce 500 million kWh per annum by the establishment of at least four generating stations at Caporetto, Tolmino, Santa Lucia and on the Canale Piava.

London.—ST. MARYLEBONE.—The Electricity Committee is seeking sanction to a loan of £20,000 in connection with the provision of a.c. meters for the change-over.

Owing to the increases in the cost of fuel, &c., the Electricity Committee proposes to increase tariffs, including the lighting flat rate (from 3½d. to 4d. per kWh) and power (½d. to ⅝d. per kWh).

L.C.C.—The County Council has approved an application by the Poplar Borough Council for sanction to the borrowing of £1,050 to defray the cost of the installation of a system of switching relays in connection with a new street lighting scheme. The proposed installation will ultimately enable all the street lamps to be switched on and off by the operation of one switch, instead of the present hand switching by staff working a long "spread over" period each day.

LEWISHAM.—The re-lighting of the whole of the streets not already provided with improved lighting at a cost of £42,440 by the South Metropolitan Electric Light & Power Co., Ltd., has been recommended by the Works Committee.

Mansfield, Notts.—TWO-PART TARIFF REDUCTION.—A reduction in the electricity two-part tariff charges as from July 1st has been authorised by the Town Council. Users will pay 15 per cent. of the first £30 of rateable value, with a minimum charge of 10s. a quarter; 10 per cent. of the next £20 and 7½ per cent. of rateable value over £50, with a running charge of ½d. per kWh.

Peterborough.—NEW BUILDING FOR MAINS DEPARTMENT.—New mains department premises are to be constructed on a site between the stores department and the power station. Tenders are to be invited and the cost met out of revenue.

SUPPLY FOR GOVERNMENT DEPARTMENT.—The electrical engineer and manager is preparing a quotation for a supply of electricity "in connection with a Government department."

Preston.—GRIT EMISSION.—Criticism regarding grit emission from Ribble power station chimneys at Penwortham, Preston, has been proved to be unfounded. The matter has been the subject of considerable controversy in the past and as a result the Electricity Commissioners instituted an inquiry. Their report, now received, reveals that the emission is well below the limit imposed.

Sedgley.—A WAYLEAVE QUESTION.—At a recent meeting of the Urban District Council there was a discussion on the Council's view that the Midland Electric Corporation for Power Distribution, Ltd., must secure the permission of the tenants of houses before taking cables over their front gardens. The Housing Committee reported upon an interview with the manager of the company, who contended that the Council could give an overriding sanction which the tenants had no right to question. The Committee recommended that, the Council having already agreed to the proposals of the

Supply Undertakings and A.R.P.

The Blackburn electrical engineer, Mr. R. H. Harral, is co-operating with the Rishton and Great Harwood Councils in a scheme to safeguard the supply in the event of aerial attack, and at Bolton the Electricity Committee is proceeding with plans for the protection of the Back-o'-th'-Bank and Spa Road power stations at a cost of £9,160. A splinter-proof room for switchboard attendants and a scheme of emergency lighting has been authorised by the Accrington Electricity Committee and the Carlisle Corporation is to carry out improvements at the electricity works at a cost of £6,824 in connection with an A.R.P. scheme. The Bermondsey (London) Electricity Committee reports that the cost of air-raid precautionary measures as outlined by the Electricity Commissioners will be £4,800, while at the Dellingburn power station of the Greenock Corporation the cost is estimated at £3,000. Work is to be put in hand immediately at Liverpool for the provision of air raid shelters, washing and first-aid rooms at the Clarence Dock, Lister Drive and Pump Fields power stations, the cost being estimated at £6,000.

company so far as it legally could, the previous resolutions should be confirmed.

Spilsby.—RURAL SUPPLIES.—Dissatisfaction at the delay in securing electricity supplies for a number of villages was mentioned at a recent Rural District Council meeting, and it was decided to write to the Electricity Commissioners regarding the matter.

Stoke-on-Trent.—NEW CABLES.—To enable an increased bulk supply to be given to Newcastle-under-Lyme, the Electricity Committee is to lay an additional feeder at a cost of £1,300. It is also to alter cables at the Cauldon canal at a cost of £1,100 and provide a supply at a cost of £1,100 to 154 houses to be erected in Commercial Street, Burslem.

Swanage.—REDUCED CHARGES.—At a recent meeting of the Council it was reported that, following a conference between representatives of the Council and the Bournemouth and Poole Electricity Supply Co., the company had written intimating certain reductions in the existing charges.

Weymouth.—EXTENSION.—A supply of electricity is to be given to Littlemayne at an estimated cost of £200.

Wolverhampton.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains to the Shaw Lane estate, Albrington, at a cost of £553, Withers estate, Bilbrook (£400), Walsall Street area (£1,118) and Rake Gate estate, Oxley (£5,190).

SUB-STATIONS.—Sites are to be acquired by the Electricity Committee for the erection of two sub-stations on the Palmer's Cross estate.

York.—STREET LIGHTING.—Electricity is to be used by the Highways Committee for lighting Micklegate, Nessgate to Blossom Street and Dringhouses from Ainsty Avenue to the city boundary. The cost is estimated at £1,293.

Traction

Blackburn.—JOINT TRANSPORT BOARD PROPOSED.—A scheme to form a Joint Transport Board for Accrington, Blackburn, and Darwen has recently received further consideration by the authorities concerned. It is recommended that the three authorities should agree to financial and transport experts being engaged to advise upon the advantages and disadvantages likely to accrue to the respective Corporations from a unified management of their transport undertakings.

France.—SPEED OF ELECTRIC TRAINS.—The French Railways are constantly trying to increase the speed of their trains by technical progress, states *Reuter's Trade Service*. At present electric trains cover the 132 miles from Paris to Le Mans in 125 min., an average speed of 63 m.p.h. The electric locomotive 2D2 can pull a train of 817 tons at a speed of 84 m.p.h. and one of 350 tons at 106 m.p.h. On the lines of the Société Nationale des Chemins de Fer a speed of 70-75 m.p.h is at present reached by regular trains over a distance of 1,000 miles.

Lancashire.—RAILWAY ELECTRIFICATION DISCUSSED.—Mr. Ashton Davies, O.B.E., chief commercial manager of the London, Midland and Scottish Railway, contributed a paper on "Railways and Lancashire of To-morrow" to a transport conference held under the auspices of the Lancashire Chambers of Commerce and the Lancashire Industrial Development Council at Manchester on July 5th. He said that the use of electricity was penetrating more and more into the daily lives of the people and it was, therefore, understandable that there should be, at times, popular clamour for the electrification of more and more railways. At the present time there were four electrified railway lines in Lancashire, namely, Manchester to Altrincham: Manchester to Bury; Liverpool to Southport; and Heysham to Morecambe and Lancaster. Over the first three routes there was an intensive service and the nature of the traffic was such that electric traction, for certain reasons, was undoubtedly superior to steam locomotion, both from efficiency and economic standpoints. Consideration had been given from time to time to the possibilities of electrifying additional sections of railway in Lancashire and adjacent portions of the surrounding counties. These schemes were attractive when viewed locally, but it has not been possible to find financial justification for any of them. In recent years the efficiency of the steam locomotive had increased enormously, and for a high frequency suburban service with multiple stops it could put up a performance almost equal to that of the electric locomotive, judged from the passenger's standpoint as to the time taken to cover a suburban journey of say 10 to 15 miles, even where the stops were frequent.

London.—MORE TROLLEY-BUSES.—On Sunday next the London Passenger Transport Board is to convert the Hampstead and Parliament Hill Fields tramway routes (Nos. 3, 5, 7 and 15) to trolley-bus operation.

Manchester.—MOTOR-BUSES TO REPLACE TRAMS.—Subject to the approval of the City Council, the Transport Committee is to substitute motor-bus services for trams on three further important routes.

South Shields.—TROLLEY-BUSES.—The Town Council proposes to extend its trolley-bus service along Sea Road to the Crown Hotel.

United States.—"ELEVATED" MAY DISAPPEAR.—According to the New York Correspondent of *The Times* the doom of New York's elevated railways was apparently sealed last week when New York City bought tax liens totalling more than $8,000,000 (£1,600,000) that had accumulated against the Manhattan Rail-

Local Authority Undertakings

Hull Engineer's Farewell Report

LAST week Mr. J. N. Waite left the service of the Hull Corporation to take up the post of manager of the South-East England Area of the Central Electricity Board. Before leaving he presented his annual report in which the usual interesting survey of the year's operations of the Electricity Department, with the characteristic detailed comments, is supplemented by a review of the principal events during the nine and a half years that Mr. Waite has been general manager and chief engineer. One of the most important changes, he considers, is the increase in efficiency and reduction in costs of the Sculcoates power station which in the draft Area Scheme of the C.E.B. was shown as a two-shift station, but upon his representations was included as a three-shift selected station. Since 1929 the decrease in coal consumed per kWh generated has been practically continuous from 2.14 lb. to 1.429 lb. Last year nearly 310 million kWh was generated, an increase of 11 per cent. on the previous year.

During Mr. Waite's period of management sales of energy have risen from 74.6 million kWh to 217.4 million kWh and the number of consumers from 19,814 to 89,452. That development has been so rapid has been due to a designed plan for achieving a cheap supply of electricity by increasing the output for all purposes. Mains were extended to every street in the city and in every built-up area outside, guarantees were dispensed with, meter rents abolished, tariffs reduced, hire and hire-purchase schemes introduced, canvassing instituted, and the assisted wiring scheme made widely known.

That this policy is continuing to produce good results is shown by the review of the past year. The number of consumers rose by 7,606 to 89,452, the increase being more than in the previous year. Sales advanced by 20.8 million kWh (nearly 11 per cent.) to 217.4 million kWh, in spite of the slight industrial depression in the last quarter. Starting from nil at the beginning of 1929-30 the number of domestic electric cookers reached 18,744 at the end of March last, having risen by 3,206 in the past year. Similarly, kettles connected have increased to 18,177, an addition of 3,155 during the year. Under the water heating scheme the number of appliances connected is as yet small (1,940 water heaters and 6,578 wash boilers), but the combined increase during the year of 2,250 represents a satisfactory improvement of 36 per cent. In commercial cooking and heating notable progress was made last year, sales of energy advancing by 35 per cent. to nearly 8 million kWh, although in this market the competition is particularly keen. A further eight electric fish ranges were installed, making the total twenty-four—the largest number installed by any undertaking in the country. With regard to public lighting, 618 additional electric lamps and directional signs were put into service and 33 miles of roadway previously lighted by gas have now been converted to electricity. The number of electric street lamps at March 31st was 49 per cent. of the total.

The year saw the inauguration of 22-kV generation at the Sculcoates power station with the commissioning of a new 30,000-kW set on October 27th, 1937. At the same time two boilers of 187,500 lb. per hr. max. continuous rating superseded two smaller units, while a complete new 22-kV switch chamber and two 15,000-kVA transformers were brought into use. In connection with the scheme it has been necessary to lay new 22-kV feeders and carry out various other works. In sub-station equipment, a special feature of the year has been the inauguration of two trolley-bus sub-stations operated on the insulated return system. In all, twenty-four sub-stations were erected, eight superseding existing structures.

The financial result of the year's working was a net surplus of £54,318 after meeting the increased cost of fuel and special expenditure on the change-over, and provision in respect of obsolete plant superseded at Sculcoates. Despite these additional items the total overall cost per kWh sold actually decreased slightly from 0.881d. to 0.879d. The average price charged fell from 0.913d. to 0.895d., representing a benefit to consumers of £16,303. The gross revenue was £902,554 (against £826,079). The number of employés of the Department at March 31st last was 1,019, an increase of thirty-three during the year.

St. Marylebone Department's Accounts

The 1937-38 statement of accounts of the St. Marylebone Electricity Department, of which Mr. C. H. Smyth is the chief engineer, shows that the total income increased from £741,341 to £777,668 and expenditure from £755,156 to £804,784, leaving a deficit of £27,126 against £13,815 in the previous year. Sales of energy increased by nearly 10 per cent. to 208.2 million kWh. Per kWh sold, the total income works out at 0.897d. against 0.938d. in the previous year. The load factor (kWh sold) improved from 30.4 to 31.3 per cent. The number of consumers at March 31st last was 31,041 against 30,462 a year before.

way Co. In so doing it opened the way to foreclosure proceedings. If these are successful in giving the properties to the city, as they are expected to be, most, if not all, of the elevated railways will be demolished, after a service of more than sixty years.

Communications

France.—RADIO LICENCES.—*Reuter* reports that radio licences in force in France at the end of May numbered 4,447,621, of which 1,191,511 were in the Paris area.

Great Britain.—USE OF RADIO RELAY IN WARTIME.—Northampton's A.R.P. proposals include the provision of electric syrens for air raid warnings, and experiments are being carried out in conjunction with the Northampton Wireless Relay Co. The provision of up to twenty syrens in various parts of the town has been suggested, and these would be connected to the relay lines and controlled from the relay station, the police station, or possibly the fire station. For experimental purposes two syrens have been mounted on the top of the fire station, and from reports by police patrolmen, who were instructed to listen in various parts of the town, the scheme is likely to be practicable.

POLICE RADIO.—In the annual report of Mr. John Maxwell, Chief Constable of Manchester, reference is made to the regional scheme for the transmission and reception of police messages by radio. Experiments are being made in the field of ultra-short waves and with small telephony transmitters for use on cars. Should these tests prove successful, it will be possible for messages to be sent to headquarters from these mobile units. This Mr. Maxwell considers to be a highly important step, as the speed with which messages are dealt with is greater, and the question of training personnel in the use of the Morse code is obviated. During the year 15,978 messages were dealt with by the regional station at Heaton Park, an increase of 50 per cent. on last year. Manchester has now fourteen cars equipped with receivers for telegraphy, five cars fitted with transmitters and receivers for telegraphy, and six cars which are equipped with ultra-short wave radio telephone receivers.

Greece.—NEW TELEPHONE SERVICE.—The Athens Correspondent of *The Times* reports that a direct telephone service between Athens, Belgrade and Berlin has been started this week. Trials are said to have given highly satisfactory results. The new service will facilitate communications between Greece and Germany, the Scandinavian and Baltic States, and with the United Kingdom and the Netherlands *via* Berlin.

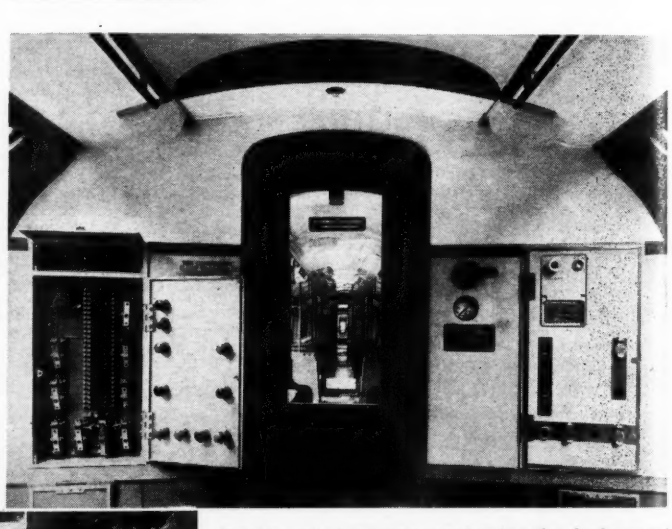
Venezuela.—MODERNISATION OF TELEGRAPH AND TELEPHONE SYSTEMS.—Included in a three-year-plan of social, economic and cultural development which has just been launched in Venezuela is the modernisation of the telegraph and telephone systems.

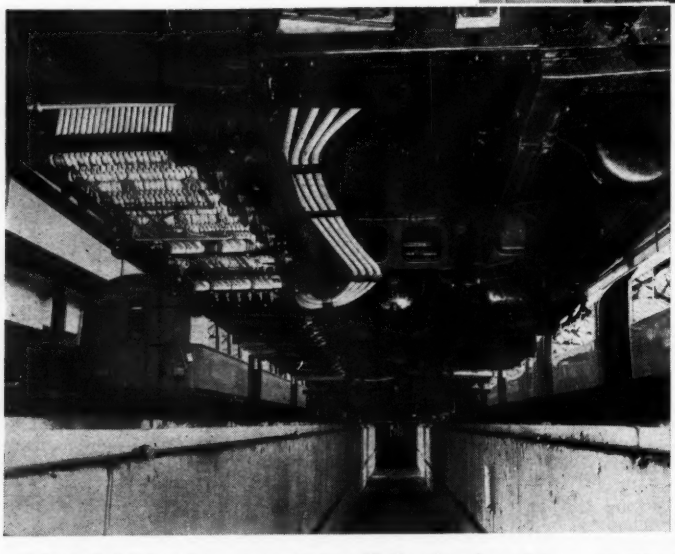
New Tube Trains

Improved design

DELIVERY was recently taken by the London Passenger Transport Board of a number of cars of improved design for use on the Northern and Bakerloo lines. In all 1,066 of these are on order. Their main features are increased passenger accommodation (by placing all the electrical equipment beneath the floor, thus avoiding the need for a separate switch compartment, the carrying capacity of a seven-car train becomes approximately that of an ordinary eight-car train) and improved performance. Inside, the cars have a light, roomy appearance and are provided with deep-cushioned seats having bucket-type backs.

Increased acceleration has been achieved by motoring a larger proportion of the axles and by arranging more of the train weight to be available for adhesion. Every motor car is equipped with two self-ventilated 168-h.p. nose-suspended motors, one in each bogie. A seven-car train will therefore have ten motors totalling 1,680 h.p. compared with 1,440 h.p. on the existing type of train. The brakes are of the self-lapping interlocked electro-pneumatic type, operated at 50 V, with automatic retardation.





Trailer end of a motor car showing the dual control boxes for operating the doors (above) and a view of the undercarriage

The electric traction equipment is of the "P.C.M." type redesigned and adapted for use in the small space available underneath the cars. Acceleration is automatic. All driving motor cars are fitted with a 5-kW, 600-50-V motor generator set, together with a 46-V, 56-Ah battery which floats across the supply. This combination supplies energy for lighting, traction control, and all auxiliary control purposes.

All the doors are air-operated and can be controlled either as a whole by the guard or as units by the passengers, subject to the guard's ultimate control. This involves the use of individual electro-pneumatic control valves and a new type of pneumatic hold-in valve has been developed for the purpose. The control of these valves is direct from guard's or passenger push-buttons, all relays being eliminated. Passenger push-buttons are inoperative when the train is running.

In order to achieve a desired rate of production and a simplification of construction, a special system of wiring eliminating as much conduit as possible has been adopted. All cables required for traction control and auxiliary wiring are laid up into pre-formed bundles and housed in specially designed ducts on the underframe. Electric heaters are situated at various points beneath the seats and are fed from the 600-V traction supply. The lighting is by 45-W high-efficiency, parallel-burning lamps on a 50-V supply. Lighting fittings have been specially designed, and consist of fluted oblong shades housed in chromium-plated frames.

The main contractors for the new cars are the Metropolitan-Cammell Carriage & Wagon Co., and the Birmingham Railway Carriage & Wagon Co., (builders), the British Thomson-Houston Co., Ltd. (traction equipment and wiring of traction and auxiliary equipment), and the General Electric Co., Ltd., and Crompton Parkinson, Ltd. (motors). The sub-contractors include:—

Westinghouse Brake & Signal Co., Ltd. (brakes); Metropolitan-Vickers Electrical Co., Ltd., and A. Wiseman, Ltd. (traction gears); Everett, Edgcumbe & Co., Ltd., and Evershed & Vignoles, Ltd. (speedometers); Benjamin Electric, Ltd. (lighting fittings, tail lamps and passenger door push-buttons); Electrical Apparatus Co., Ltd. (auxiliary contactors); Young Accumulator Co., Ltd. (batteries); General Electric Co., Ltd. (car heaters); Patent Lighting Co., Ltd. (multi-point connection boxes and auxiliary control gear cases); Clifford & Snell, Ltd. (drivers' and guards' loudspeaker equipment); Klaxon, Ltd. (windscreen wipers); G. D. Peters & Co., Ltd. (door equipment); Hoffman Manufacturing Co., Ltd., Skefko Ball Bearing Co., Ltd., and British Timken, Ltd. (bearings, etc.); and B. A. Holland Engineering Co., Ltd. (compressors).

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Alton.—July 14th. U.D.C. One 45-b.h.p. electric motor and starter. (July 1st.)

Australia.—SYDNEY.—September 28th. Department of Railways (Electrical Branch). Turbo-alternator, surface condenser, feed water heaters, &c., for Ultimo power station. (T. 23984/38.)*
September 1st. County Council. 120/11,000-V metal-clad oil circuit-breaker switching equipments. (T. 23987/38.)*

Argentina.—BUENOS AIRES.—August 22nd. National Sanitation Works Department. Six electric pumping sets, accessories and spares. (T.Y. 23107/38.)*
July 20th. One electric generating set. (T.Y. 23358/38.)*

Beckenham.—July 19th. Electricity Undertaking. P.i., lead covered, steel wire armoured cable and joints, pilot cable and cable covers and tiles. (See this issue.)

Belfast.—July 29th. Electricity Department. Steel fire-resisting partition, portable loading elevator, and replating storage battery cells at Harbour power station. 33-kV indoor and outdoor switchgear and interconnecting cables, 33-kV underground cables and pilot and telephone cables. (See this issue.)

Berwickshire.—July 18th. County Council. Electrical installation at new central school, Chirnside. R. Wood, director of education, County Offices, Duns.

Birmingham.—July 25th. Electric Supply Department. Domestic electrical apparatus for twelve months. (July 1st.)

Blackpool.—July 25th. Borough Council. Stores and materials, including electrical sundries. (See this issue.)

Blairgowrie and Rattray.—July 11th. Town Council. Electric lighting installations in fifty-six houses. W. D. M. Falconer, burgh surveyor, Wellmeadow (deposit £1 1s.).

Bognor Regis.—July 11th. U.D.C. Electric lighting installations at Rose Green Road and Gossamer Lane. (July 1st.)

Bridport.—July 13th. Electricity Department. 6,600-V overhead lines, together with a section of 230/400-V lines. (June 24th.)

Bristol.—July 11th. Electricity Department. 6,600-V transformer and l.v. feeder voltage regulators. (June 24th.)

Bury.—July 18th. Electricity Department. P.i. lead-covered cables for twelve months. (See this issue.)

Cardiff.—July 12th. Education Department. Electrical installation at Colchester Avenue High School for Girls. City electrical engineer, The Hayes (deposit £1 1s.).

Dublin.—August 6th. Electricity Supply Board. Four 15,000-kVA transformers with on-load tap-changing equipment. (June 24th.)

East Ham.—August 13th. Borough Council. Electrical installation in connection with the alterations and additions to the Hart Sanatorium, Woodford Green, Essex. (See this issue.)

Egypt.—CAIRO.—July 16th. Ministry of Public Health. 300 electricity meters. (T.Y. 23368/1938.)*
August 3rd. Electrical equipment for the electrical installation extension at Fayoum. (T. 23674/38.)*

Erith.—July 11th. Electricity Department. Laying and jointing of h.v. and l.v. cables. (July 1st.)

Felixstowe.—July 22nd. Electricity Department. Four metal-clad, 11,000-V switchgear units. (July 1st.)

Finchley.—July 25th. Electricity Department. Immersion heaters and circulators and cooking utensils for twelve months: wrought iron brackets for street lighting fittings and control equipment for mercury discharge lighting. (July 1st.)

Glasgow.—July 11th. Corporation. Electrical installation at Temple police office garage. Town Clerk.
July 14th. Electrical installation at estate at Holmfauldhead Drive (162 houses). Town Clerk (Room 36).

India.—SIMLA.—July 30th. Indian Stores Department. Insulating materials. (T. 23759/38.)*

Kirriemuir.—Equitable Co-operative Society. Electrical work at new bakery. D. Forbes Smith & Johnston, architects, 244, High Street, Kirkcaldy.

Leeds.—July 16th. Health Committee. Electrical work at the City Hospital, Seacroft. Town Clerk's Office, Room 57, Civic Hall.

Lochgelly (FIFE).—July 11th. Town Council. Electric lighting of 112 houses. Town Clerk (deposit £1 1s.).

London.—July 21st. H.M. Office of Works. Electrical accessories. (See this issue.)
FINSBURY.—July 13th. Borough Council. Installation of electric lighting equipment at Bull Stairs Wharf Depot. (July 1st.)
ST. PANCRAS.—July 14th. Electricity Department. P.i. lead-covered cables, meter boards, cookers, fires, washboilers and water heaters for twelve months. (July 1st.)
ISLINGTON.—August 10th. Borough Council. Electric wires, conduits and other accessories. (See this issue.)

Manchester.—July 11th. Electricity Department. One mercury-arc rectifier. (July 1st.)

Morley.—July 21st. Housing Committee. Electrical work at sixty houses and eight flats on the Wide Lane estate. Town Clerk, Town Hall (deposit £2 2s.).

Newcastle-under-Lyme.—July 19th. Highways Committee. 280 lamps, lanterns, fittings and columns for street lighting within the borough. (June 24th.)

New Zealand.—CHRISTCHURCH.—August 4th. Electricity Department. Fifteen 200-kVA single-phase transformers. (T.Y. 23251/38.)*

Portsmouth.—July 19th. Electricity Undertaking. One 37,500 kVA three-phase transformer. (July 1st.)

Roxburgh.—July 12th. County Council. Electrical work at police houses and garage at Jedburgh. County Clerk, County Offices, Newtown St. Boswells (deposit 10s. 6d.).

South Africa.—PRETORIA.—July 14th. Public Works Department. Apparatus for an electric clock system. (T. 23183/38.)*
July 21st. One 75-kVA transformer, one h.v. switch and 1,000 ft. of cable. (T.Y. 23459/38.)*
BRAKPAN.—July 15th. Town Council. Sewage disposal plant, including electric motors. (T. 23461/38.)*
CAPE TOWN.—July 20th. Electricity Undertaking. 3,500 yd. each of e.h.v. and pilot cable. (T.Y. 23649/1938.)*
July 20th. Electricity Supply Commission. Pin type and suspension strain insulators. (T. 23650/38.)* Electric light poles and fittings. (T. 23642/38.)*
PIETERSBURG.—August 8th. Municipality. Electric motor-driven pumps. (T. 23601/38.)*
JOHANNESBURG.—July 23rd. City Council. Twenty-five miles of cadmium copper trolley wire. (T. 23947/38.)*
July 20th. Electricity meters. (T.24115/38.)*

Stockport.—July 18th. Electricity Department. Sluice valves, and the electrical operation of these and other valves. (See this issue.)

Uruguay.—MONTEVIDEO.—July 13th. Electricity Supply and Telephones Administration. 5,000 6-kV, 1,000 15-kV, and 300 33-kV porcelain insulators. (T. 23473/38.)*
August 2nd. 11,700 electric light switches and 5,950 separate covers. (T.Y. 23732/38.)*
July 21st. 32-V, 110-V, 225-V and 230-V metal filament lamps. (T.Y. 23556/38.)*

Walthamstow.—July 23rd. Borough Council. Hydraulic and other machinery and piping and electrical equipment in connection therewith at the Concrete Flag Works, Low Hall Farm. Town Clerk (deposit £2 2s.).

Watford.—July 13th. Corporation. Pumping plant consisting of duplicate sets of centrifugal bore-hole and high lift pumps complete with electric motors, control gear, valves, pipework, &c. Town Clerk, Municipal Offices, 14, High Street.

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* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Aberdeen.—County Council. Accepted. Electrical work at houses at Pitsligo (£189).—J. B. Smith.

Barking.—Electricity Committee. Accepted. Feeder pillar (£58) and distribution board (£49).—Siemens Bros. & Co.

Bradford.—Education Committee. Accepted. Electrical installation at Swain House school extension (£104).—W. P. Holt & Co.

Cardiff.—Electricity Committee. Accepted. Twelve 500-kVA transformers (£541 each).—Hackbridge Electric Construction Co.

London.—L.C.C.—Education Committee. Accepted. Electrical work at schools: Bermondsey central (£996).—Troughton & Young. Glengall Road, Poplar (£883).—Colston Electrical Co. Merton Road, Putney (£915).—Holliday & Son.
Housing Committee. Accepted. Electrical installations in two blocks of dwellings on Newburn Street estate, Lambeth (£504).—Holliday & Son (Electrical).
FULHAM.—Electricity Committee. Recommended. Underground transformer equipment (£1,207).—Lucy & Co.

Manchester.—Electricity Committee. Recommended. Electricity meters.—Ferranti; Met.-Vick. Electrical Co. Electric motors.—Electric Construction Co.; B.T.H.: Laurence, Scott & Electromotors. Electric kettles.—Premier Electric Heaters.

Middlesex.—Health Committee. Electrical installation at Warkworth Institution:

	£		£
W. G. Perry & Co. Recommended	**1,233**	Holliday Hall and Stinson ...	1,539
Springvale Electrical Co. ...	1,420	Read and Partners ...	1,611
Page and Girling, Ltd. ...	1,429	Pinching and Walton ...	1,631
Francis Polden and Co. ...	1,447	Troy and Co.	1,7[illegible]
Middlesex Electrical Co....	1,456	Siemens Bros. and Co. ...	1,845
Colston Electric Co. ...	1,466	E. W. Merredew	1,912
Christy Bros. and Co. ...	1,532	Davis Myer and Co. ...	2,086

Recommended. X-ray apparatus for Redhill Hospital (£5,720).—A. E. Dean & Co.
Accepted. One mobile X-ray unit (£304).—Solus Electrical Co.
Estates Committee. Recommended. Electrical installation at Twickenham offices (£329).—E. W. Merredew.

Morecambe.—Highways Committee. Accepted. Eight illuminated bollards.—Revo Electric Co.

Newcastle-on-Tyne.—City Council. Accepted. Laying of underground cables for an electricity supply to the extensions at the Shotley Bridge Colony (£841).—F. Reid, Ferens & Co.

Rawtenstall.—Electricity Committee. Accepted. Transformer.—British Electric Transformer Co.

Salford.—Health Committee. Recommended. X-ray apparatus (£2,177).—Mottershead & Co.
Electricity Committee. Recommended. Circuit-breaker parts and new tanks (£4,638).—Met.-Vick. Electl. Co.

Seaton Valley.—U.D.C. Accepted. Electrical installations: 176 houses at Backworth Station.—J. B. Wilson. 180 houses at Nelson Village.—R. W. Leek & Co.

Sheffield.—Electricity Committee. Accepted. Works auxiliary transformers.—Hackbridge Electric Construction Co.

(£887); Electric Construction Co. (£3,760). Meter-testing equipment.—Cambridge Instrument Co. (£554); Met.-Vick. Electrical Co. (£422); Foster Enginering Co. (£414); Landis & Gyr (£89). Sub-station switchgear (£9,171).—A. Reyrolle & Co.

Stoke-on-Trent.—Electricity Committee. Accepted. Replating battery (£528).—Tudor Accumulator Co.

Notes

Storm Causes Supply Interruptions

Considerable disorganisation was caused on Tuesday by thunderstorms which occurred over the South of England. Lightning which struck overhead lines brought Southern electric trains to a standstill and the supply in large areas of Kent and East Sussex was interrupted. Nearly half an hour's delay due to supply failure was experienced on the railway lines between Redhill and Brighton and Eastbourne, Brighton and Lewes, and Brighton and West Worthing and Seaford. Brighton was also affected by a supply failure which brought the trams to a standstill. Many P.O. telephone lines were put out of action.

B.E.A.M.A. Helps the E.I.B.A.

The British Electrical and Allied Manufacturers' Association has sent a donation of £100 to the E.I.B.A. in support of the campaign to raise £190,000 this year to strengthen E.I.B.A. finances. It is hoped that other associations, companies and individuals will follow this good lead.

Fatality

"Death by misadventure" was the verdict returned at the inquest at Wallasey last week on Albert Low, electrical engineer, aged forty-four, who received a fatal electric shock when he was carrying out repairs at the Corporation generation station in Limekiln Lane, Wallasey. It was stated that Low came into contact with a live part in a 6,600-V feeder cubicle. The coroner told the jury that Low was a fully qualified man, engaged on the routine job of making a particular cubicle alive. He had a duster in his hand, and when he had finished the job appeared to have flicked a live part with this duster.

Leeds University Extension

Mr. Frank Parkinson's gift to Leeds University is shortly to assume practical shape. The University has announced that work is soon to commence upon the new wing which will be mainly occupied by the Arts Faculty. It will include a council chamber, committee rooms, twelve lecture theatres, five smaller lecture rooms and a large mathematics room. The wing will be surmounted by a handsome tower and will form a worthy addition to the city's architecture.

A New Permanent Bronzing Process

With the object of giving lead-coated steel a better protection against outside influences the Euston Manufacturing Co., Ltd., has recently developed the "Emco" permanent bronzing process which gives an extremely smooth finish, unaffected by heat, ultra violet rays or carbon monoxide. The process can be applied to light or dark penny bronze, chrome, aluminium, gold, silver, antique brass and antique copper finishes. Articles thus finished are easily cleaned by an occasional wash followed by polishing with a dry duster. The company is to apply the process to its products, which include lighting fittings and signs, and it is also prepared to treat customers' own metalwork at its factory at 56-60, Grove Road, Walthamstow.

The General Electric Co.'s stand at the Royal Show, Cardiff **(see page 57)**

Information Department

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

EMPIRE knife sharpener.
OSTER hair clippers.
CECIL KEY chargers.
500-cycle alternator.
RONEX burglar alarm contact pad.

Death of Sir John Snell

WE have to report with regret the death on Wednesday last of Sir John Snell, who was chairman of the Electricity Commission from its inception until his retirement a few months ago.

[Elliott & Fry
The late Sir John Snell

John Francis Cleverton Snell was born at Saltash, Cornwall, in 1869, the son of a commander in the Royal Navy. He was educated at Plymouth Grammar School and King's College, London, of which he was elected a fellow in 1929. He commenced his long career in the electrical profession with Woodhouse & Rawson and Crompton & Co. at the Kensington Court and Notting Hill power stations, and was for a time in Sweden. In 1892 he became assistant to Major-General Webber, and in the following year was appointed resident engineer at the King's Road station, St. Pancras. Three years later he went to Sunderland as borough electrical engineer and tramway manager, and remained there for about ten years.

He then commenced in practice as a consultant, becoming a partner in the firm of Preece, Cardew, Snell & Rider. Among the important work which he did at this period was that in connection with the acquisition of the telephone service by the G.P.O.; he was the principal technical witness for the Post Office in the arbitration proceedings which this acquisition involved.

This was the beginning of a long record of public service. He was a valuable member of a number of important Government Committees including the Nitrogen Products Committee, the Electrical Trades Committee, the Electric Power Supply Committee, the Water Power Resources Committee (chairman) and Committee on Electroculture (chairman).

When the Government decided to act upon the Electric Power Supply Committee's report and co-ordinate the industry under an Electricity Commission, Sir John was appointed Chief Electricity Commissioner, a post which he occupied with conspicuous success.

Upon the appointment of the Weir Committee he acted as technical adviser, and upon the passing of the 1926 Act he became responsible for the drawing up of the regional schemes for the co-ordination of generation and main transmission which that Committee recommended. Later he was the technical member of the McGowan Committee which sought to bring about a similar co-ordination on the distribution side. His public services had been recognised by the conferment of a knighthood in 1914, and in 1925 he was awarded the G.B.E.

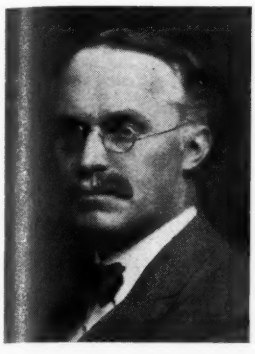
Similarly to Mr. W. M. Mordey, whose death we report on page 68, Sir John was a past-president of the Institution of Electrical Engineers (1914-15) and an honorary member. He joined the Institution as an associate in 1891 becoming a member five years later. He was also a member of the Institution of Civil Engineers.

For some years past Sir John had struggled against continued ill-health which was no doubt due to the heavy burden which he had to bear. It may be said with truth that more than any other man he was responsible for the present structure of the electricity supply industry and the steps which have been taken to weld it into a co-ordinated whole.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. B. O. Anson, O.B.E., M.I.E.E., Assistant Engineer-in-Chief, G.P.O., retired on June 30th after forty-two years' service. Mr. Anson entered the Post Office in 1896 as a sorting clerk and telegraphist, and seven years later was transferred to the Engineering Department where, after five years in a clerical capacity, he received a technical appointment. In 1911 he was transferred to the Engineer-in-Chief's office, where not only was he responsible for the whole of telephone exchange maintenance, but he also played an important part in the introduction of automatic telephony into this country. He became executive engineer in 1920 and was subsequently assistant staff engineer (1925), staff engineer (1931) and Assistant Engineer-in-Chief (1934). He was mainly responsible for the establishment of the training school and the circuit laboratory, of both of which he was the head for a number of years. Mr. Anson was also largely responsible for the development of automatic telephony in rural areas. He was largely concerned with the negotiations with telephone manufacturers of successive agreements for the purchase of exchange equipment, and during his career travelled extensively abroad. He has served on a number of committees including technical, organisation and control, nomenclature, education, Whitley procedure and promotion, and he was perhaps the chief inspirer of the Telecommunications Conventions held at Swanwick in 1935 and 1937. He was for many years on the Council of the Institution of Post Office Electrical Engineers and of many of its committees.



[Elliott & Fry
Mr. B. O. Anson

Mr. A. More, whose appointment as electrical engineer to the Wick Town Council was recorded in our last issue, obtained his technical education at Edinburgh University, where he graduated B.Sc. in electrical engineering in 1936, and in 1937 he obtained a similar degree in mechanical engineering. Since that time he has been with the Caithness County Council as assistant engineer.

I.E.E. Students' Awards.—The Council of the Institution of Electrical Engineers has awarded the following premiums for students' papers for the session 1937-38:—Students' Premiums (value £10) to Messrs. J. E. Houldin; J. R. Hughes; J. M. Meek, and G. H. Rawcliffe. Students' Premiums (value £5) to Messrs. J. Bertram; R. J. Franklin, G. G. Isaacs, C. H. W. Lackey; T. M. Lott; P. d'E. Stowell; J. L. Wooldridge; J. E. Woollaston.

Mr. C. H. Lake, M.I.E.E., city electrical engineer of Nottingham, was married on June 30th at All Souls Church, Langham Place, London, to Miss Doris Eaton, of Derby. Our picture shows Mr. and Mrs. Lake after the wedding ceremony.

Mr. and Mrs. C. H. Lake, after their marriage at All Souls Church, Langham Place, W.

Mr. C. H. Bulman, chief technical assistant with the Cardiff Corporation Electricity Department, has been recommended by the Electricity Committee for the appointment of deputy city electrical engineer at a salary of £762 per annum.

Manchester Electricity Committee has granted leave of absence to **Mr. H. C. Lamb,** who is president of the I.M.E.A., to enable him to attend a sectional meeting of the World Power Conference, to be held in Vienna next month.

In a comment on E.P.E.A. affairs last week we referred to the election of **Mr. W. E. Swale,** of Birmingham, to the National Executive Council. Mr. Swale is, of course, with the Manchester Electricity Supply Department.

Mr. Felix A. Rogers is the newly appointed secretary of the Electric Light Fittings Association, the change of address of which is announced in our "Business Notes" to-day. Mr. Rogers is to continue as secretary of the Electrical Fair Trading Council.

[Elec. Rev. photo.
Mr. Felix Rogers

Mr. Thomas A. Poole has joined the staff of the Insulating Varnish Department of Pinchin, Johnson & Co., Ltd. Mr. Poole received his training at the Goldsmith's College (London University). From 1914-1919 he was on active service. He afterwards had experience with J. Stone & Co., Ltd., in connection with train-lighting equipment and was subsequently with the British Electric Transformer Co., Ltd., Hayes. From 1922-1929 he was employed by the English Electric Co., and was ultimately engaged in putting into service electrical plant for the Tata Power Co. in India. Subsequently he was resident engineer (Bombay) for the Great India Peninsula Railway electrification. From 1931-1938 Mr. Poole was technical representative for the Sterling Varnish Co., Ltd.

Mr. J. D. Bambach, G.E.C. publicity officer in Australia, has been appointed electrical editor to the Australian E.R.D.A. magazine.

Mr. T. Handley, Home Counties representative for Ensign Lamps, Ltd., has been appointed assistant London manager at 101, Southwark Street, S.E.1.

Mr. J. McGillivray, deputy engineer and mains superintendent of the Cambridge Electric Supply Co., Ltd., is retiring after thirty-eight years with the company.

Mr. C. F. Hitchcock, who has been with Flinders (Wholesale), Ltd., for the past five years, has now been appointed sales engineer for the Electrical Department, and will be attached to the company's head office at Ipswich.

Mr. G. Smith, B.Sc., who is an electrical engineer on the staff of the Midland Electric Corporation for Power Distribution, Ltd., Birmingham, was married recently at Church Street Baptist Church, Kidderminster, to Miss Dorothy Myra Duignan.

Mr. B. Berrie, one of the principals of the firm of Graham Berrie, electrical contractors, of Newcastle, was married recently at the John Knox Presbyterian Church, Newcastle, to Miss Doris Teasdale, also of Newcastle.

Following an extensive tour of the United States and Canada visiting various factories represented by his organisation, **Mr. H. Constad,** managing director of Batwin Electric Motors, Ltd., has concluded arrangements to manufacture several well-known products in this country and these will shortly be available to the electrical industry.

Mr. A. Hewitt, chairman of the North Wales and South Cheshire J.E.A., was elected chairman of the Conference of Joint Electricity Authorities and Joint Boards at the recent annual meeting.

Mr. A. E. Somers, managing director of the Bell Investment Trust, has joined the board of Ismay Industries, Ltd.

Mr. H. G. Wilson, managing director of Partridge, Wilson & Co., Ltd., has lent his grounds at Manor House, Normanton-on-Soar for a garden fête and sports in aid of the local parish church, on July 16th, and invites any electrical men in the district to attend.

Mr. W. Graeme Hendrey, M.I.E.E., has been appointed a director of the Anchor Cable Co., Ltd.

Obituary

A. V. Dyer.—The death is announced of Mr. Albert Victor Dyer, A.M.I.E.E., which occurred on July 2nd at his home at Ilford.

Capt. R. G. Rees.—The death occurred recently of Captain Robert Gordon Rees, of the Black Boy Hotel, Sudbury, who, in his capacity as engineer, superintended the laying of the Wemyss and district tramway, the Falkirk tramway and the Llandudno tramway. He also assisted in the building of the Rhondda tramway, of which company he was subsequently appointed superintendent overhead engineer, at Porth. He

then became overhead engineer to the Bolton Corporation, from which position he joined the Forces during the war. He was a prominent figure in Sudbury, of which borough he was Mayor in 1934.

The Hon. Thomas Ahearn, pioneer Ottawa business man and industrialist, died at his home on Ottawa on June 28th at the age of eighty-three. Originally a telegraph operator, he entered the field of electrical utilities and eventually formed, through mergers, the Ottawa Electric, Heat & Power Co., of which he was president. In 1928 he was made a member of the Privy Council.

Mr. H. F. Joel.—We regret to learn from Mr. H. F. Joel, junior, of the death of his father, Mr. Henry Francis Joel, which occurred on June 17th at the age of eight-nine. Mr. Joel was one of the pioneers of the electrical industry, and was responsible for a number of patents.

The Late Mr. W. M. Mordey

WE regret to report the death of Mr. W. M. Mordey on July 1st shortly after his return from the I.E.E. Conversazione. He was 83 years of age.

William Morris Mordey was a Durham man and commenced his career at the age of fourteen in the Postal Telegraph Service and devoted all his spare time to the study of electricity and magnetism, which later enabled him to conduct classes at the City and Guilds Technical Institute. He joined the Brush Electrical Engineering Co. in 1881 as superintendent of the testing department and turned his attention to dynamo design.

[Elec. Rev. photo.
The late Mr. W. M. Mordey

As an associate of the Institution of Electrical Engineers (then the Society of Telegraph Engineers and Electricians) he read a paper in 1884 on "Prejudicial Actions in Dynamo Machines" and two years later caused a stir in electrical circles by a contribution to the *Philosophical Magazine* on "The Dynamo as a Generator and as a Motor" in which many prevailing ideas were upset. His first most notable pioneer a.c. work was the introduction in 1887 of the alternator which, with his transformers and other equipment, was developed by the Brush Co. as the "Mordey-Victoria alternating-current system" and was installed in about sixty towns in Great Britain and overseas. The operation of this system led to the reading of another paper before the Institution of Electrical Engineers on the subject of "Alternating-current Working" for which he was awarded the Institution Premium.

Although so absorbed in the "heavy" branch of electrical engineering Mordey did not neglect "light-current" matters and in 1883 he presented a paper before the I.E.E. in which he described experiments upon the resistance of metals and showed that in a finely divided state they had a negative temperature coefficient and that their differentiation from carbon on this ground was consequently invalid. In 1901, in another I.E.E. paper, he dealt with dielectric hysteresis, showing that the losses in a.c. cables from this cause might be very serious. He thus drew attention to a matter which later was recognised as of the first importance.

Electric railway traction also occupied his attention, and in 1902 he read an important paper on the subject, prepared in conjunction with Mr. Bernard M. Jenkin, before the Institution of Civil Engineers. This secured the authors two gold medals and had the distinction of being discussed at five meetings of the Institution.

His study of magnetic phenomena gave him material for a discourse before the Royal Institution in 1923, when he demonstrated that small particles of magnetic metals and non-conducting magnetic minerals were powerfully repelled in a.c. fields due to magnetic hysteresis. One practical outcome of this was the Mordey mineral separator. Mordey dealt with this matter in a number of papers, notably those read before the South African I.E.E. and the B.A.

His connection with the Institution of Electrical Engineers was of the closest character right from his entry as an associate in 1881. This and his valuable work in electrical technique was recognised by his election as president in 1908 and by the conferment of honorary membership in 1932. It was during his term as president that the negotiations were carried out for the acquisition of the Institution's present headquarters, and in 1915 he presented to the Institution a "commonplace book" of Michael Faraday which he had received from Jane Barnard, Faraday's niece.

Mordey made a number of contributions to the ELECTRICAL REVIEW, one of his earliest being a survey of the electrical developments during the preceding twenty-five years written for our twenty-fifth anniversary number. He was a great walker and up to a few years ago a mountaineer—he was a member of the Alpine Club. He was also a good bass singer and a member of the Bach Choir.

The funeral took place at Croydon Crematorium on Wednesday last.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

U. S. Air Conditioning (Great Britain), Ltd.—Private company. Registered June 29th. Capital, £6,000. Objects: To adopt an agreement dated May 10th, 1938, between United States Air Conditioning International, Inc. and F. L. James and J. C. Cleeves, to enter into an agreement with the said company in accordance with the provisions of the agreement of May 10th, to condition, treat and regulate the supply and extraction of air, gases and vapours of all kinds, and to carry on the business of mechanical, heating, ventilating and electrical engineers, &c. The directors are: F. L. James, Rookwood, Station Avenue, Walton-on-Thames; and J. C. Cleeves, Loveldene, Copthorne Bank, near Crawley, Sussex. Registered office: 70, Victoria Street, S.W.1.

Canal Street Engineering Co., Ltd.—Private company. Registered June 27th. Capital, £100. Objects: To carry on the business of refrigeration and cold storage engineers, &c. The directors are: T. Attenborough, "The Gables," 134, Loughborough Road, West Bridgford, Notts; and A. W. Pickerell, 9, Fleeman Grove, West Bridgford. Registered office: 16, Canal Street, Nottingham.

Decca Radio & Television, Ltd.—Private company. Registered June 29th. Nominal capital, £90,000. Objects: To acquire the business of radio manufacturers and dealers carried on by the Decca Gramophone Co., Ltd., and to carry on the business of manufacturers of and dealers in radio gramophones, television apparatus and electrical components, &c. The subscribers are: F. G. Maw and A. F. A. Powles, both of Amberley House, Norfolk Street, W.C.2. Registered office: 12, Norfolk Street, W.C.2.

Resistance Welding Machines, Ltd.—Private company. Registered June 29th. Capital, £1,000. Objects: To carry on the business of electrical, mechanical and general engineers and contractors, manufacturers of and dealers in electrical and other welding machines, &c. The directors are: P. Mayer, 540, Avenue Louise, Brussels; and F. J. Elvy, 270, The Avenue, West Wickham, Kent. Registered office: 68, Victoria Street, S.W.1.

Returns of Electrical Companies

Kleenair Co., Ltd.—Private company. Registered June 24th. Capital, £1,500. Objects: To acquire the business of a heating and ventilating expert and adviser carried on by W. Dawson at Golders Green, N. The permanent directors are: W. Dawson, 50, St. George's Road, Golders Green, N.W., and D. de Valdeavellano, 36, Mark Lane, E.C.3. Registered office: Bank Chambers, 329, High Holborn, W.C.1.

Telephone and General Trust, Ltd.—Issue on November 18th, 1937, of £200,000 debenture stock, part of a series already registered. (Particulars of issue filed June 25th, 1938.)

Edmundson's Electricity Corporation, Ltd.—The nominal capital has been increased by the addition of £3,000,000 in £1 ordinary shares beyond the registered capital of £7,000,000.

Hudsons Radiolectels, Ltd.—Particulars filed of debentures not exceeding £500 authorised June 11th, 1938, charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £300.

Engineering Specialists, Ltd.—Two mortgages on premises in The Causeway, Maldon, Essex, both dated June 7th, 1938, to secure £400 and £100 respectively. Holders: Mrs. L. H. Samman, Madeira Hall, Ventnor, I.W., and others.

Pioneer Private Telephone Co., Ltd.—Satisfaction in full on May 23rd, 1938, of debenture dated November 4th, 1935, and registered November 19th, 1935. (According to the register of mortgages the debenture registered November 19th, 1935, originally secured all moneys due to bank.)

Wellingborough Electric Supply Co., Ltd.—Capital, £50,000 in £10 shares. Return dated April 26th, 1938. All shares taken up. £50,000 paid. Mortgages and charges, £45,000.

Gent & Co., Ltd.—Capital, £50,000 in 20,000 preference and 30,000 ordinary shares of £1. Return dated March 9th, 1938. 7,427 preference and 24,376 ordinary shares taken up. £13,387 paid on 3,957 preference and 9,430 ordinary shares. £18,416 considered as paid on 3,470 preference and 14,946 ordinary shares. Mortgages and charges, £9,000

Western Electric Co., Ltd.—Capital, £20,000 in £1 shares. Return dated April 14th, 1938. All shares taken up. £20,000 paid. Mortgages and charges, nil.

Lang Electrical Co., Ltd.—Capital, £100 in £1 shares. Return dated December 31st, 1937 (filed April 22nd, 1938). 51 shares taken up. £51 paid. Mortgages and charges, nil.

Walter Balmford, Ltd.—Capital, £5,000 in £1 shares. Return dated November 19th, 1937 (filed June 14th, 1938). 2,050 shares taken up. £2,050 paid. Mortgages and charges, nil.

Electronic Devices, Ltd.—Capital, £100 in £1 shares. Return dated December 31st, 1937 (filed May 28th, 1938). All shares taken up. £60 paid. £40 considered as paid. Mortgages and charges, nil.

City Notes

Greenwood & Batley, Ltd., held their annual meeting on July 1st, when Col. H. A. Micklem (chairman), who presided, said that a general improvement in trade was apparent during the year under review, in which the company had its full share. Their sales increased by 70 per cent., as compared with the preceding period, and it was due to this large increase, coupled with but small expansion of their overhead charges, that the results showed so marked an improvement. This increase was by no means confined to munition work, which accounted for 23 per cent. of the sales, nor to the armament programme in this country, though no doubt a good many orders coming to the company for machinery resulted directly or indirectly from it. The percentage of home sales during the period was 58.66. During the past year there had been some further increase in the rates of wages, and a week's holiday with pay had also been conceded. The 1937 Factories Act would also involve additional expense. There had been an appreciable rise in the cost of materials and difficulty was experienced in obtaining prompt deliveries of their raw materials, particularly steel, but the position in this respect had now improved. These were factors which might exercise their effect in the future; in fact, there did not appear to be so great a volume of miscellaneous work available at the present time. Whether this was a temporary condition or was likely to continue for a protracted period it was difficult to say. Their order book, however, enabled him confidently to forecast that, barring completely unforseen circumstances, the current year would prove a very satisfactory one.

The Midland Counties Electric Supply Co., Ltd.—The subscription list opened on Wednesday last for an issue of £1,750,000 3½ per cent. debenture stock, 1952-62 at par. The issue is partly for cash and partly for conversion of the existing £1,000,000 4 per cent. stock, which is called for redemption in October. The cash lists opened on Wednesday, but conversion applications will be received up to July 16th. Holders of the 4 per cent. stock who do not choose to convert will be paid off at 103 in October. The Power Securities Corporation is arranging the underwriting for a commission of 1½ per cent. and for the sum of £12,375 is defraying all expenses other than stamp duty. The new stock will be redeemed at par in 1962, but the company may repay at 101 during the preceding ten years. The net proceeds of the present issue will be applied in repayment of the outstanding 4 per cent. debenture stock and in providing funds for the further development of the operating companies.

The Mexican Light & Power Co., Ltd., held its annual meeting in Toronto on June 29th, when Mr. Miller Lash (chairman), who presided, said that the shortage of power which confronted the company continued to have the serious attention of the board. In April and May of the present year the rate of growth over 1937 was somewhat less than in the first quarter, due to general business conditions in Mexico. The proposed new Federal Law relating to electrical energy mentioned in the President's report had not yet been considered in the present extraordinary session of Congress; therefore, one of the most serious adverse factors which had hindered the company's progress remained unchanged. There were no surplus profits for the half-year ended December 31st, 1937, available for any payment of interest on the cumulative income debenture stock in July.

The Mexico Tramways Co.—Presiding at the annual meeting held in Toronto on June 29th Mr. Miller Lash (chairman) said that notwithstanding the increase in car earnings, the year's operations again showed a deficit, which, however, was less than the 1936 deficit, but, as mentioned in the report, the accumulated losses over the past thirteen years were very large. The results of the company's operations had been adversely affected by the decline in the value of the Mexican peso since March 18th from 3.60 Mexican pesos to the United States dollar to about 4.78 at the present date.

The British Oxygen Co., Ltd.—Shareholders on Monday last authorised the increase of the capital to £6,000,000 by the creation of 2,000,000 £1 5 per cent. cumulative second preference shares. The lists opened yesterday (Thursday) for an issue of 1,000,000 preference shares at 22s. 6d. each. The net proceeds of the issue will be used to repay bank advances and to provide further capital to finance extensions necessary, both at home and overseas, to meet the increasing demand for the products of the company and its subsidiaries.

The Baqdad Light & Power Co. reports a net revenue for 1937 of £73,018, as compared with £58,584 in the preceding year, to which is added interest, £74. From this is deducted depreciation reserve, £19,506, income tax, N.D.C., Iraq Government participation in profits, and contingencies, £28,600, leaving a net profit of £24,986 (against £20,760). The ordinary dividend for the year is 3¼ per cent., tax free (against 2 per cent.), and £6,890 is carried forward, as compared with £6,403 brought in.

Aron Electricity Meter, Ltd., reports a net profit for the year ended March 31st of £32,578, as compared with £40,240 in the preceding year. This figure is subject to a charge of £10,516 for income tax on the profits of 1936-37, leaving £22,062 to be carried to the balance sheet, to which is added £19,778 brought in. It is proposed to pay a final dividend of 10 per cent. less tax, on the ordinary shares, making 15 per cent. for the year, and to carry forward £25,127. Meeting: July 18th.

The Lincolnshire & Central Electric Supply Co. reports a profit for the year ended March 31st of £42,994, as compared with £37,489 in the previous year, to which is added £9,105 brought in. General reserve receives £2,500 and the final ordinary dividend is 5 per cent., making 9 per cent. for the year (against 8½ per cent. on smaller capital). The balance carried forward is £14,725.

Christy Brothers & Co., Ltd., report a net profit for the year ended March 31st of £50,111, as compared with £42,940 for the preceding year, which included a favourable balance of £4,950 on sale of investments. Last year's allocations (totalling £18,000) to employés' superannuation reserve for subsidiary, and general reserve are repeated. A sum of £2,000 is set aside for N.D.C. and £5,022 is absorbed by income tax. The ordinary dividend for the year is 11 per cent. (against 10 per cent.) and £26,927 is carried forward (against £22,838 brought in).

Mirrlees Bickerton & Day, Ltd.—Presiding at the annual meeting held on June 29th Mr. C. Day (chairman) said that the output of the oil engine section of their business was the largest for a number of years. A large proportion of the orders were from abroad, and had been secured against intense and frequently subsidised competition. Orders for centrifugal pumps had established a new record, and the new IMO screw pump was now in production. Orders for condensing plant had been well maintained, while the automatic stoker department had made excellent progress.

The South Metropolitan Electric Light & Power Co., Ltd., proposes to increase its capital from £1,100,000 to £1,600,000 by the creation of 500,000 £1 third preference shares. A meeting to consider the proposal and necessary alterations of the company's articles will be held on July 22nd.

The Ascot District Gas & Electricity Co. has issued £30,000 3¾ per cent. redeemable debenture stock, 1963-68, to Seymour Pierce & Co., stockbrokers, at 99½ per cent. net.

W. & T. Avery, Ltd., have declared a final dividend of 10 per cent., less tax, making 15 per cent. for the year (same).

The Bristol Tramways & Carriage Co., Ltd., has announced an interim ordinary dividend of 4 per cent. (against 3 per cent.).

G. D. Peters & Co., Ltd., have declared an interim dividend of 10 per cent. For the five months to December, 1937, the dividend was at the rate of 15 per cent. per annum.

Crossley Brothers, Ltd., are paying a dividend for the year to April 30th of 7 per cent. (against 5 per cent.) on the 7 per cent. non-cumulative preferred ordinary shares, and 2½ per cent. on the deferred ordinary. The latter will be the first ordinary payment since the dividend of 3 per cent. for 1920.

Hall Telephone Accessories (1928), Ltd., has declared an interim dividend of 5 per cent., less tax (same).

The Great Northern Telegraph Holding Co. (Denmark) is paying a first and final dividend of 23½ per cent. for the year to June 30th (same).

Stocks and Shares

TUESDAY EVENING.

THE changed sentiment in the position of American markets and industry is responsible, more than anything else, for the brighter tone which has come over Stock Exchange affairs. Prices of some of the American industrials have risen by as much as 60 per cent. in the last fortnight. These advances have been accompanied by an accession of hopefulness in America that has found a minor reflection on this side. It has affected the general tone throughout Stock Exchange markets more than the actual volume of business transacted. Nevertheless, it is a fact that most markets are more active than they have been for some time past, and such activity, as is well known, spells rising prices, it being equally well understood that business falls away at a time when dullness and depression pervade Stock Exchange markets.

The improvements which were recorded in our last week's price lists have been fully maintained, and in some cases carried further. There is a noticeable increase in the willingness of the public to take an interest in stocks and shares at to-day's prices.

London Passenger Transport

The fifth anniversary of the inauguration of the London Passenger Transport Board finds the Board as alive as it was in 1933 to the necessity for keeping abreast of London's requirements in the way of transport. The Board has now a Bill under the consideration of a Select Committee of the House of Lords which will empower it to extend trolley services, construct new works and generally to obtain authority for developing its energies in a number of directions.

The price of the "C" stock, at 75, is 10s. higher on the week. The 5 per cent. "B" stock, at 118¼, shows a gain of 2 points. London Electric Transport 2½ per cent. guaranteed is quoted ex dividend at 91. Central Electricity issues hold their previous figures. Gilt-edged stocks, under the leadership of rises in British Government Funds, are a strong market.

Electrical Equipment Shares

Following upon the advances secured last week by a number of shares in the list of electrical manufacturing companies, further improvements have been shown by the prices during the past few days. The hope of an early termination of the civil war in Spain, the newly arranged Anglo-German pact, and the early coming into force of the Anglo-American trade treaty are three of the factors which operate strongly in the diversion of hitherto idle capital into shares of companies that may be expected to benefit from settlement of international disturbance.

The trade recession in this country, of which so much has been heard during the past few months, is thought, perhaps optimistically, to be approaching its conclusion; and, discount-

ing the future, industrial shares are once more coming into the limelight. General Electrics, at 77s. 6d., are a florin higher. Callenders at 4⅛ show ¼ rise, as also do Ericsson Telephone shares. Advances will be noticed in the prices of Associated Electrical, British Insulated, Enfield Cables and Telegraph Constructions, the last named being 2s. 6d. up at £2. English Electrics at 31s. have risen 3s. 6d. Automatic Telephones hardened to 41s. 9d. The B shares stand at 37s. 9d. Switchgear & Cowans at 15s. 9d. are 1s. to the good.

New Issues

The Midland Counties Electric Supply Company is making an issue this week of £1,750,000 of three-and-a-half per cent. debenture stock, 1952-62, at 100. Interest is payable half-yearly at the end of June and December. Calls on the new stock are spread over four instalments, the last being due on September 30th next. The issue is in the nature of a conversion, £1 million of the stock having been reserved for proprietors of the existing £1 million 4 per cent. debenture stock, which is repayable at 103. The security is gilt-edged.

The South Metropolitan Electric Light and Power Company will hold a meeting on July 22nd to consider proposals for the creation of half a million £1 third preference shares. This is something of a novelty in the electric lighting area. The South Metropolitan is controlled by the County of London Electric Supply Company, nearly all the South Metropolitan ordinary shares being held by the County Company. The ordinary shares of the latter are 6d. harder at 49s. 6d. North Metropolitans advanced to 48s. 9d., which is 2s. 6d. up. The Scottish and provincial groups show decided strength. Southern Areas at 21s. 6d. put on the pence. Bournemouth are ⅛ up at 3¼. Edmundson's rose 1s. Both Clyde Valley and Scottish Power are better.

Mexican Matters

Mexican Light and Power 5 per cent. first mortgage bonds, at 30, have put on a further 2½ points, following upon their gain of a similar amount last week. The annual general meeting, held lately in Toronto, gave the chairman an opportunity for emphasising the shortage of power which confronts the company. To general business conditions in Mexico the chairman attributed the fact that the rate of growth during 1937 showed a tendency to slow up. The adverse factors which have seriously hampered the company's progress remain unchanged.

On the day that this meeting was held the annual general meeting of shareholders of the Mexico Tramways Company also took place under the same chairmanship. The increase in the car earnings fails to compensate for losses incurred through other causes. The operations for the year again showed a serious deficit.

Electric Power in Japan

It will be remembered that Japan recently passed laws which, in effect, give the Japanese Government control of the country's electric power. It is stated this week that a new company—the Japan Electric Power Generation and Transmission Company—has been formed for the purpose of taking over properties of existing electric power companies in Japan.

The Tokyo Electric Light Company comes into this scheme, and presumably will receive shares in the new concern in exchange for its own. The new company will be of an official, or semi-official, character. The bonds for the Tokyo Electric Light Company will be unconditionally guaranteed by the new company and by the Japanese Government itself. Standing as the Tokyo Electric sixes do, at 49, the investor's estimation of the security, under present conditions, is obvious.

Cable and Wireless

Evidence of the various above-mentioned factors, making for better world conditions, is furnished by the attention paid to Cable and Wireless ordinary stock. The price has risen 5 points during the past few business days, and, after being neglected for some time past, the market has come into renewed prominence. The preference and the income stocks are both virtually unchanged. The company has offered to stockholders of not more than £25 of the 4 per cent. funded income stock, the price of par; that is 100. The idea is to reduce the number of proprietors of oddments. The chairman, at the recent meeting, mentioned that there were more than 12,000 individual holders of £25, or less, of this particular issue. The price in the market is just 100.

Miscellaneous Matters

British Electric Traction deferred has added a century to its previous score of 925. In the dollar list, American Telephone and Telegraph put on 4, at 145½. Brazilian Tractions provided a mild feature, with a jump of 2½ to 14. Brussels buyers are attracted to the shares by the fact that the company, with its promising outlook, pays a small dividend in spite of exchange handicaqs. Victoria Falls ordinary are in Cape demand: the price is 2s. better at 67s. Some of the Canadian utilities present a firmer front: British Columbia A at 31 and the B at 5 are both better. The latest disturbances in Palestine have not prevented improvement to 31s. in Palestine Electric "A" shares, and to 25s. in Jerusalem Electrics. Perak River Hydro shares at 23s. are 6d. to the good. The satisfaction of being able to record price-rises in so many different groups must be felt to be believed.

Share List of Electrical Companies

	Nom.	Dividend. Previous.	Last.	Price July 5.	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	65/–	+⅛	4 12 4
City of London	1	7½	7½	33/6	–	4 9 7
Clyde Valley	1	7	8	37/–	+6d.	4 6 8
County of London	1	10½	10½	49/–	+6d.	4 5 7
Edmundson's 7% Pref.	1	7	7	32/–	–	4 7 6
Do. Ord.	1	8	9	39/6	+1/–	4 11 2
Elec. Dis. Yorkshire	1	9	9	42/6	–	4 4 9
Elec. Fin. and Securities	1	12½	12½	50/–	–	5 0 0
Elec. Supply Corporation	1	11	12	52/6	–	4 11 5
Lancs Light and Power	1	7½	7½	32/–	–	4 13 9
Lond. Assoc. Electric	1	—	7	30/–	–	4 13 4
London Electric	1	8	7	35/6	–	3 19 0
London Power Deb. Red.	Stock	5	5	106½	+1	4 14 0
Metropolitan	1	10	12	49/6	+6d.	4 16 9
Midland Counties	1	7½	8	37/–	+6d.	4 6 6
Mid. Elec. Power	1	8	9	2	–	4 10 0
North Eastern Electric Ordinary	1	7	7	32/6	+6d.	4 7 6
Do. 7% Pref.	1	7	7	32/6	–	4 6 2
Northampton	1	10	10	46/3	–	4 6 7
Notting Hill 6% Pref.	10	6	6	14xd.	+4/6	4 5 9
North Met. Elec. Ordinary	1	10	10	48/9	+⅛	4 2 0
Do. do. 6% Pref.	1	6	6	29/6	–	4 1 4
Scottish Power	1	8	8	37/–	+1/–	4 6 6
South London	1	7	7	32/–	–	4 7 6
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	18/9	+⅛	8 0 0
Yorkshire Elec.	1	8	8	40/6	–	3 19 0
PUBLIC BOARDS.						
Central Electricity, 1950–70	Stock	5	5	114	–	4 7 9
Do. 1955–75	,,	5	5	116	–	4 6 2
Do. 1951–73	,,	4½	4½	108	–	4 3 4
Do. 1963–93	,,	—	3½	99	–	3 10 8
London Elec. Trans. Gtd.	,,	—	2½	91xd.	–	2 15 0
London & Home Counties, 1955–75	,,	4½	4½	112	–	4 0 4
London Passenger Transport, A	,,	—	4½	116½	–	3 17 2
Do. do. B	,,	—	5	118½	+2	4 4 5
Do. do. C	,,	4	4½	75	+½	5 13 4
West Midlands Joint Elec. 1948–68	,,	—	5	112	–	4 9 3
TELEGRAPH AND TELEPHONE.						
American Tel. & Tel.	$160	9	9	145½	+4	6 3 9
Anglo-Am. Tel. Pref.	Stock	6	6	107	–	5 12 2
Do. Def.	,,	1½	1½	25	–	6 0 0
Cable & Wireless 5½% Pref.	,,	4½	5½	97	–	5 13 7
Do. Ord.	,,	—	4	53½	+5	7 9 7
Do. Income	,,	—	—	100½	–	3 19 6
Globe Tel. & Tel. Ord.	10	5½*	7½*	15½	–	4 18 4
Do. do. Pref.	10	6	6	13½	–	4 10 7
Great Northern Tel.	10	20	20	36	–	5 11 1
Marconi-Marine	1	10	7½	26/3	–	5 14 3
Oriental Telephone Ord.	1	12*	12*	58/9	–	4 1 8
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	6/3	–	–
Do. do. 2nd Pref.	5	Nil	Nil	3/9	–	–
Do. do. 5% Deb.	Stock	Nil	Nil	13	–	–
British Electric Traction Def. Ord.	,,	5	5	1025	+100	–
Do. do. Pref. Ord.	,,	8	8	160	–	5 0 0
Brazil Traction	$100	70 cts.	$1	14	+2½	–
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	100xd.	+3d.	5 0 0
Mexican Light Common	$100	Nil	Nil	1	–	–
Do. do. 1st Bonds	$500	5	5	30	+2½	–
Victoria Falls Ord.	1	20	12	67/–	+2/–	3 11 6
West Riding	1	6½	10	33/9	+⅛	–
MANUFACTURING COMPANIES.						
Aron Electricity Ord.	1	15	15	1½	–	8 11 6
Assoc. Elec. Ord.	1	10	10	38/6	+1/–	5 4 0
Do. Pref.	1	8	8	36/6	–	4 7 6
Babcock & Wilcox	1	10	10	40/–	+1/3	5 0 0
British Aluminium Ord.	1	10	12½	53/–	+1/9	4 14 4
British Insulated Ord.	Stock	20	20	4½	+⅛	4 9 0
Brush Ord.	,,	Nil	Nil	26½	–	–
Callenders'	1	20	20	4⅝	+⅛	4 6 7
Do. 6½% Pref.	1	6½	6½	31/3	–	4 2 4
Crompton Parkinson Ord.	5/–	12½	12½	27/6	–	–
Do. 8% Pref.	1	8	8	37/6	–	4 5 4
Electric Construction	1	10	12½	32/6	–	7 13 10
Enfield Cable Ord.	1	25	25	2½	+⅛	–
English Electric	1	Nil	10	31/–	+3/6	6 7 0
Do. do. Pref.	1	6½	6½	25/6	–	5 2 0
Ericsson Tel.	5/–	25	25	41/3	+⅛	3 0 6
Ever Ready	5/–	45	35	19/–	+6d.	9 4 2
Ferranti Pref.	1	7	7	27/6	–	5 2 0
G.E.C. Pref.	1	6½	6½	32/6	–	4 0 0
Do. Ord.	1	17½	20	77/6	+2/–	5 3 1
Henley's	5/–	15	20	20/–	–	5 0 0
Do. 4½% Pref.	1	4½	4½	1½	–	4 0 0
India-Rubber Pref.	1	5½	5½	21/3	–	5 3 6
Johnson & Phillips	1	10	12½	37/6	–	6 13 4
Lancashire Dynamo	1	20	25	57/6	–	8 13 8
Siemens Ord.	1	7½	7½	25/–	–	6 0 0
Telegraph Construction	£1	7½	10	40/–	+½	5 0 0

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1936

18494. "Dynamo-electric machines." F. W. B. Hambling. October 5th, 1936. (486753.)
21315. "Switches for electric-heating apparatus." H. Tillmann and W. Piepenstock. August 31st, 1936. (486516.)
24066/24067/24068. "Alternating-current commutator machines particularly, but not essentially, alternating-current commutator motors." J. Pintsch Akt.-Ges. September 2nd, 1935; February 29th, 1936; and March 3rd, 1936. (Additions to 466481.) (486530/486579/486580.)
24088. "Electric signalling systems." A. Cianchi. September 2nd, 1936. (486581.)
27319. "Electronic tube with secondary emission." Radio Akt.-Ges. D. S. Loewe. October 16th, 1935. (486657.)
29888. "Circuits for operating high-pressure mercury-vapour lamps." General Electric Co., Ltd., and V. J. Francis. November 3rd, 1936. (Cognate applications 12237/37 and 13288/37.) (486586.)
33169. "Electrical communication systems." H. O. Ellis and W. H. B. Cooper. December 3rd, 1936. (Cognate application 3032/37.) (486764.)
33199. "Electric circuits for generating currents of saw-tooth wave form." Telefunken Ges. für Drahtlose Telegraphie. December 3rd, 1935. (486528.)
33245. "Electrical measuring or indicating apparatus such as watt-meters." C. G. Mayo. December 3rd, 1936. (486765.)
33294. "Gaseous-discharge tube cathode." D. V. Edwards and E. K. Smith. December 4th, 1936. (486767.)
33299. "Electrical insulating materials." Bushing Co., Ltd., and W. J. Brown. December 4th, 1936. (486534.)
33314. "Spools for electric inductances, transformers and the like." Standard Telephones & Cables, Ltd., and F. B. Turner. December 4th, 1936. (486535.)
33316. "Electric communication cables." Standard Telephones & Cables, Ltd., and A. W. Gent. December 4th, 1936. (486536.)
33318. "High-pressure metal vapour electric-discharge devices and methods for operating them." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Glühlampen). December 4th, 1936. (Cognate application 26800/37.) (486768.)
33489. "Electron-discharge devices for use in television and like systems." W. E. Williams. December 7th, 1936. (486548.)
33533. "Electrical processes and apparatus for determining or following changes occurring in a test body while an external influence acts upon it for determining the properties or nature of the body or of the influence." A. E. O'Dell (Haardt & Co. Akt.-Ges.). December 7th, 1936. (486856.)
33545. "Mercury switches." P. S. Bear and H. E. Bucklen. December 7th, 1936. (Convention date not granted.) (486770.)
33549. "Telephone or like systems." Automatic Telephone & Electric Co., Ltd., W. Saville and A. H. Williams. December 7th, 1936. (486554.)
33559. "Radio and like high-frequency apparatus." Marconi's Wireless Telegraph Co., Ltd. December 6th, 1935. (486557.)
33590. "Electro-thermic production of magnesium." American Magnesium Metals Corporation. January 10th, 1936. (486558.)
33591. "Electrically heated furnace." American Magnesium Metals Corporation. January 10th, 1936. (486559.)
33601. "Elevator signal and control systems." Westinghouse Electric & Manufacturing Co. December 7th, 1935. (486598.)
33691. "Radio sets." Standard Telephones & Cables, Ltd., W. Bond and G. Davies. December 8th, 1936. (486666.)
33725. "Methods of increasing the electrical conductivity of copper-tin alloy." British Thomson-Houston Co., Ltd. December 9th, 1935. (486600.)
33731. "Phase-multiplying transformers." Kabusiki Kaisya Tyuoseisakusyo. May 23rd, 1936. (486924.)
33745. "Earth-leakage indicating and protective arrangements for electric plants." R. Wideroe. December 8th, 1936. (486672.)
33876. "Devices for the automatic vending of electricity, gas, water or the like." Allgemeine Elektricitäts-Ges. December 9th, 1935. (486929.)
33947. "Electric circuit arrangements for combining the effects of two or more alternating-current signal sources." H. A. M. Clark. December 10th, 1936. (486931.)
33948. "Low-frequency thermionic amplifiers." Telefunken Ges. für Drahtlose Telegraphie. December 10th, 1935. (486870.)
33957. "Electric incandescent lamps and discharge apparatus." Arcturus Radio Tube Co. December 11th, 1935. (486872.)
33963. "Electrode holder for use in electric welding." J. S. Schofield. December 10th, 1936. (Cognate application 21526/37.) (486562.)
34040. Image-dissector tubes for use in television systems." Farnsworth Television, Inc. December 31st, 1935. (486787.)
34058. "Electric remote-control systems for television apparatus." F. Von. Okolicsanyi. December 12th, 1935. (486604.)
34065. "Remote-control systems and switch devices therein." Standard Telephones & Cables, Ltd., S. G. Knight and E. I. Staples. December 11th, 1936. (486882.)
34136. "Electron-discharge devices." Marconi's Wireless Telegraph Co., Ltd., and G. B Banks. December 11th, 1936. (486888.)
34137. "Tuning and other indicator and scale arrangements suitable for use, for example, in radio receivers or wave meters." Marconi's Wireless Telegraph Co., Ltd., N. M. Rust and N. Levin. December 11th, 1936. (486889.)
34150. "Variable-electric condenser with multiple units for keyboard operation." R. Kapp. December 12th, 1935. (486605.)
34186. "Apparatus for transmitting images of moving visual phenomena." Radio Akt.-Ges., D. S. Loewe. December 12th, 1935. (486896.)
34310. "Electron-discharge device amplifiers." Siemens and Halske Akt.-Ges. December 12th, 1935. (486793.)
34621. "Electron multipliers." V. Zeitline, A. Zeitline and V. Kliatchko. February 8th, 1936. (486795.)
34624. "Electric switches." British Thomson-Houston Co., Ltd. December 17th, 1935. (486796.)

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315. "Directional lighting fittings." General Electric Co., Ltd., and W. F. S. Debenham. January 5th, 1937. (486618.)
551. "Mercury-arc rectifiers." Signum Akt.-Ges. January 7th, 1936. (486675.)
1520. "Coiled electric-heating elements." General Electric Co., Ltd., and H. L. Bentley. January 18th, 1937. (486678.)
2717. "Electrical apparatus for the reproduction of sounds by means of at least two loudspeakers." J. Furstenzeller. January 29th, 1937 (convention date not granted). (486801.)
4304. "Circuit arrangement for automatic telephone systems for metering connections of different grades according to time and zone." Mix & Genest Akt.-Ges. February 13th, 1936. (486802.)
4635. "Junction boxes for use with wiring-in conduits, electric switches and other electrical accessories, and as looping-in and inspection boxes." C. H. Bell & Co., Ltd., and G. W. Collinson. February 16th, 1937. (486804.)
5073. "Control of electric arcs, particularly in electric furnaces." Furnace Holdings, Ltd. (Buffalo Electric Furnace Corporation). February 19th, 1937. (486805.)
7399. "Magnetically operated mercury electric switches." G. Wilkinson. March 13th, 1937. (486688.)
7569. "Electric light fittings." N. Dennes, and Metropolitan-Vickers Electrical Co., Ltd. March 15th, 1937. (486689.)
7576. "Compounding of alternating-current generators." A. Schipper. March 18th, 1936. (486690.)
7865. "Insulating supports for electric conductors." A. Rahim. March 17th, 1937. (486691.)
8244. "Means for synchronising electrically driven recording apparatus with fluid-pressure-operated apparatus such as gun-firing control apparatus on aircraft." Dunlop Rubber Co., Ltd., G. E. Beharrell, J. Wright and H. Trevaskis. March 20th, 1937. (486694.)
9428. "Electric measuring instruments of the moving-coil type." Bryce, Ltd., and J. Ayres. April 2nd, 1937. (486695.)
11855. "Electrical measuring instruments having thermo-electric elements and methods of making same." P. Gossen. April 26th, 1937. (486814.)
13193. "Insulation of metallic sheets." British Thomson-Houston Co., Ltd. May 15th, 1936. (486625.)
13567. "Enclosed fuses." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. May 15th, 1936. (486816.)
13852. "Magnetic attraction and repulsion motors." E. F. M. De Tastes. May 18th, 1936. (Cognate application 13853/37.) (486699.)
15447. "Fluid-flow electric switches." British Thomson-Houston Co., Ltd. June 3rd, 1936. (486627.)
16919. "Method of metallisation by cathode disintegration." B. Berghaus. June 17th, 1936. (486629.)
17480. "Electrically heated incandescent igniters for internal-combustion engines." G. M. Paulson. June 23rd, 1936. (486702.)
21183. "Telegraph-exchange systems." Standard Telephones & Cables, Ltd. July 30th, 1936. (486703.)
22000. "Electrode systems with unsymmetrical conductivity." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. August 13th, 1936. (486829.)
22883. "Device for feeding electric arcs in light-projecting apparatus." I. Punski. August 22nd, 1936. (Cognate application 22884/37.) (486705.)
24153. "Electric condensers." C. Lorenz Akt.-Ges. September 3rd, 1936. (Addition to 472095). (486709.)
24692. "Method of making high ohmic resistances with low-temperature coefficient." W. W. Triggs. (Rosenthal-Isolatoren Ges.) September 10th, 1937. (486639.)
26246. "Three-position electric switches." Arrow-Hart & Hegeman Electric Co. October 21st, 1936. (486640.)
27621. "Method of making a laminated insulator structure." W. W. Triggs (Woodall Industries, Inc.). October 11th, 1937. (486642.)
29001. "Arc-welding systems." British Thomson-Houston Co., Ltd. October 23rd, 1936. (486724.)
30523. "Electrodes for the production of per-compounds." G. Adolph and M. E. Bretschger. November 12th, 1936. (486728.)
31891. "Electron-discharge devices." Standard Telephones & Cables, Ltd. December 5th, 1936. (486840.)
32724. "Antenna structures for radio direction-finding systems." November 28th, 1936. (Addition to 466948.) C. Lorenz Akt.-Ges. (486652.)
33220. "Lighting fittings." British Thomson-Houston Co., Ltd. December 1st, 1936. (486732.)
33319. "Electric level-indicating apparatus for liquids." I. Farfallini. December 2nd, 1937. (486733.)
34874. "Indirect lighting devices." C. E. Bouy. December 16th, 1937. (486737.)
35015. "Electric circuit-breakers having arc-extinguishing arrangements." British Thomson-Houston Co., Ltd. December 17th, 1936. (486739.)

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1337. "Microphones." Marconi's Wireless Telegraph Co., Ltd. January 14th, 1937. (486655.)
2786. "Electrically propelled amusement vehicles operating on conductive floors." C. H. Harrison, and British Motor Boat Manufacturing Co., Ltd. January 28th, 1938. (486741.)
4612. "Mercury arc rectifiers." Signum Akt.-Ges. January 7th, 1937. (Divided out of and addition to 486675 and 552/37.) (468743.)
7899. "Insulating supports for electric conductors." A. Rahim. March 17th, 1937. (Divided out of 486691.) (486746.)
9585. "Radio direction-finder." E. J. Hefele. October 2nd, 1935. (Divided out of 482717.) (486576.)
11334. "Image-transformer." Radio Akt.-Ges. D. S. Loewe. October 16th, 1935. (Divided out of 486657.) (486750.)
11335 "Television-receiving tube." Radio Akt.-Ges. D. S. Loewe. October 16th, 1935. (Divided out of 486657.) (486915.)
13058. "Mercury switches." P. S. Bear and H. E. Bucklen. December 7th, 1936. (Divided out of 486770.) (486937.)

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Acton.—Factories for Old Oak Factories, Ltd., Telford Road and Brunel Road; Hillier, Parker, May & Rowden, architects, 27, Maddox Street, London, W.1. Enlargement of technical college (£10,075); E. Plaistowe & Sons, Ltd., South Road, Southall.

Arnside.—Convalescent Home; H. S. Fairhurst & Son, architects, 55, Brown Street, Manchester.

Barking.—Extensions to factory, Alfred's Way; Cheesewright & Nicholls, Ltd. Dwellings (503), Heath Street and St. Paul's Road; borough surveyor.

Beeston (NOTTINGHAMSHIRE).—Cinema, Queen's Road, for Majestic Cinemas, Ltd.; Midland Counties & District Estate Agency, Ltd., Chaddesden Park, near Derby.

Bishop Auckland (Co. DURHAM).—Rebuilding of the Bishop Auckland Hospital (£25,000); D. Crawford, architect, Market Chambers.

Bolsover.—Cinema, for New Palace (Bolsover), Ltd.; Bocock & Kirk, architects, West Hill Drive, Mansfield.

Chelmsford.—School, Rainsford site (£57,900); Mr. Allardyce, architect.

Chessington.—Houses (622), Byhurst Farm estate, Hook Road; Knight, Frank & Rutley, surveyors, Hanover Square, London, W.1.

Chester-le-Street.—Houses, Edmondsley, Fatfield, and Urpeth; R.D.C. surveyor.

Chorley.—Houses (146), Carr Lane estate; J. B. C. Hardman, Ltd. Houses (447), Park Hall estate, Charnock Richard; Lofthouse Associated Properties.

Cleckheaton.—Houses (670), Windy Bank Lane, for Spenborough U.D.C.; surveyor.

Colchester.—Transport depot, Magdalen Street, for T.C.; G. T. Morris, architect, St. Peter's Chambers, High Street.

Congleton.—Houses (64), Bromley Farm estate; borough engineer.

Desborough.—Premises at the junction of Rushton Road and Union Street, for Desborough Co-operative Society, Ltd.

Dudley.—Houses (46), Buffery Road; A. W. Heathcock. Houses (44), Sledmore Farm estate; F. H. Roberts.

Durham.—Gymnasium at Durham Girls' County school for the C.C. (£6,000); T. B. Shilling, builder, New Washington. Gymnasium at Wellfield A. J. Dawson school for the C.C. (£4,000); Sowerbys (Contractors), Ltd., Newcastle-on-Tyne.

Ellesmere Port.—Houses (20), Wolverham estate; P. J. Hodges, clerk to U.D.C., Council Offices.

Ely (CAMBRIDGESHIRE).—Cinema, Market Place and Bray's Lane, for Ely Cinema Co., Ltd.; Ward & Woolnough, architects, Westgate, South Brink, Wisbech.

Esher.—School (£46,297); Holliday & Greenwood, Ltd.

Finchley.—Dwellings (220), Temple Fortune estate; Anderson, Forster, Warren & Wilcox, architects, New Square, Lincoln's Inn, W.C.2.

Forth (LANARKSHIRE).—Houses (100), for Scottish Special Areas Housing Association, Ltd.; the secretary, 73a, Shandwick Place, Edinburgh, 2.

Glasgow.—Extensions (£70,000), at Notre Dame College for Girls', Downhill; T. S. Cordiner, architect, 261, West George Street. Reading room, University Avenue (£20,000), for University Court; T. H. Hughes, architect, 204, George Street.

Greenock.—Additions and alterations to Town Hall (£20,000), for T.C.; Watson, Salmond & Gray, architects, Central Station Buildings, Union Street, Glasgow.

Guildford.—Houses (32), Gate House estate, Epsom Road; Hiscock & Morreau.

Guisborough.—Houses (95), Westgate; H. Wilkinson.

Hampshire.—School, Havant, for the County E.C., County Offices, Winchester.

Horbury.—Houses (32), Beechwood Grove and Oakwood Grove; H. Smith & Son.

Hull.—Factory, Wincolmlee; Burniston Chemical Co., Ltd.

Hyde.—Houses (30), Dowson Road; Dean & Whipp, Henry Street. Houses (120), Walker Lane estate; borough surveyor.

Isle of Wight.—Institution, Parkhurst (£36,500), for Isle of Wight C.C.

Kenton (NEWCASTLE-ON-TYNE).—Houses; F. Davies, architect, 560, Durham Road, Low Fell, Gateshead.

Kilmarnock.—Offices, &c., for Southhook Potteries, Ltd. (£8,000); G. Steel, architect.

Kirkintilloch.—Houses (131), Green's estate; burgh surveyor.

London.—(BERMONDSEY).—Flats and shops, Queen's Place and Tyers estate; borough engineer. Shops and flats, The Grange and Stanworth Street; Gale, Heath & Sneath, 15, New Bridge Street, E.C.4. Rebuilding of Spa Works, Galleywall Road; Minoprio & Spenceley, 18, Seymour Street, W.1. (CAMBERWELL).—Tenements (73), Garden Street; Rowley Bros., Ltd., Tower Works, Dunloe Avenue, N.17.

Longton (STAFFORDSHIRE).—Houses (19), Spring Garden Road; Holloway & Co.

Manchester.—Factory, Ayres Road, Old Trafford, for Austin Walters & Son, Ltd., 26, Little Peter Street, Knott Mill; George Dobson & Sons, general contractors, 42, Tonman Street, Deansgate.

Mansfield.—Enlargement of Forest Hospital (£10,000); borough engineer. Rebuilding Ritz Cinema, Chesterfield Road; Ritz Pictures, Ltd.

Market Bosworth.—Houses (22), Ibstock, Ratby and Bosworth, for R.D.C.; Goddard & Wain, architects, Station Chambers, Coalville.

Matlock.—Houses (107); U.D.C. surveyor.

Merton.—Houses (36), Queen's Road: Wakeford & Sons, architects, 184, Clapham Road, London, S.W.9.

Middlesex.—Community centre, Philip Lane, Tottenham (£8,640); county architect.

Morecambe.—Houses (18), Woodhill Lane; C. & W. Taylor. House and riding school, Middleton Road; W. Bargh. Buildings, Winter Garden site; F. W. Woolworth & Co., Ltd.

Neath.—Houses (42), Adoldy Road, Glyn-Neath; J. T. Jones, R.D.C., engineer, 13, Orchard Street.

Newcastle-on-Tyne.—Extensions and alterations to premises, Avon Rubber Co., 21, Oxford Street; H. Wiles, architect, 658, Durham Road, Gateshead.

Northampton.—Houses and shops, St. Andrews Street; R. Finnegan, Broad Street. Houses (29), near Welford Road; A. Glenn & Sons, Ltd.

Peterborough.—Large extensions to garage, Lincoln Road, for Eastern Counties Omnibus Co., Ltd.; H. & J. Taylor (contractors), Ltd., Canada House, Hither Green Lane, London, S.E.13.

Pontypridd.—Houses (76), near Ebenezer Street, Rhydyfelin; W. E. Lowe, U.D.C. surveyor.

Preston.—School, Farringdon Park; borough engineer.

Rochdale.—Houses, Clover Hall and Channing estate; borough engineer.

Rugby.—Houses (26), for R.D.C.; Sabin and Young, Walsall.

Ryhope (NEAR SUNDERLAND).—Houses (150), for R.D.C.; E. Hitchen, R.C. Offices, Sunderland.

Salford.—Houses (50), Summerville estate; J. Gerrard & Sons, Ltd. Flats (208), Odsall Lane; W. Gornall & Sons, Ltd.

Sheffield.—Houses (64), Cooks Wood Road; J. Copley & Sons, Ltd. Extensions to transport depôt, Shoreham Street (£37,000); W. G. Robson, Ltd.

Southall.—Factory and offices, Uxbridge Road; Hayes Bridge Joinery & Builders Supplies, Ltd.

South Shields.—Outpatients' block at General Hospital for T.C. (£7,500); borough engineer.

Staffordshire.—School, Codsall (£27,735), for the County E.C.

Staines.—School, Stanwell Road (£61,318); Holliday & Greenwood, Ltd.

Sunbury.—School and clinic, Chertsey Road (£30,045); Limpus & Son, Ltd.

Sunderland.—Acetylene factory, Pallion estate, for Saturn Oxygen Co., Ltd.; hotel, Durham Road; and extensions, Roker Avenue, for British Ropes, Ltd.; W. and T. R. Milburn, architects, 17, Fawcett Street.

Sutton Coldfield.—Houses (14), Barnard Road; Castle Bromwich Estates, Ltd. Houses (22), Darnick Road; F. H. Wilkinson. Houses (53), Westwood Road; British Ensign Builders. Seven shops, Bakers Lane; L. F. Bullivant.

Thornaby-on-Tees.—Houses (136); A. Robinson, builder, Devonshire Road, Middlesbrough.

Totnes.—Houses (188), Watcombe estate, for T.C.; Torquay Building Co., Ltd.

Tottenham.—Baths, Hale site; borough engineer. Factory and offices, Courley Street; C. E. Hartshorne, 90, High Holborn, London, W.C.1. Enlargement of Parkhurst school (£23,350), and reconstruction of Lancastrian school (£29,740), for the E.C.

Tunstall.—Houses (12), near Stewart Road; D. G. N. Walley.

Tynemouth.—Houses (14), Balkwell Avenue; Haswell & Son. Extensions to hospital, Moor Park (£39,574); borough engineer.

Uttoxeter.—Houses (24), Westlands Road; U.D.C. surveyor.

Wealdstone.—Site development, High Street, for Harold Samuel Properties, Ltd.; C. Pragnell.

Wembley.—Fire station, outbuildings and firemen's houses; borough treasurer, 117a, High Road.

Whiston.—Cinema, Warrington Road, for Greenough Bros. Works, Cumber Lane, for Stoves, Ltd., Rainhill.

Whitehaven.—Factory, for the Cumberland Silk Weaving Co., Ltd.

Wolverhampton.—Houses (28), Fallings Park estate; A. Boswell. Houses (388), Marsh Lane; W. Whittingham & Co., Ltd. Houses (23), Sandon Road; L. T. Taylor. Houses (28), Uplands Avenue; T. Wellings & Son. Development of Palmers Cross estate, Pendeford Avenue; New Lowlands Estate, Ltd. Factory and offices, Aldersley, for the Stoll Chair Manufacturing Co. Eighteen shops and flats, Stafford Road; E. A. Colman. Additions to the Wolverhampton grammar school (£8,000), for the E.C.

York.—School, Water Lane, for the E.C.

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from June 29th:—

Magnet (design only). No. 580802. Class 13. Electrodes of ordinary metal for use in electric arc welding.—Georg Bock, trading as E. Nacks Machfolger, Berlin, Germany. (British representatives: Marks and Clerk, 57-58, Lincoln's Inn Fields, W.C.2).

Prilect. No. 581871. Class 13. Electric lamps (ordinary), electric kettles, electric heating devices in the form of rings (being parts of heating apparatus), electric heating and lighting fittings, electric smoothing irons, and combined electric shaving apparatus consisting of water-heating utensils, mirrors and lamps, all of ordinary metal.—T. Price & Son (Stampers), Ltd., Forward Works, Spring Hill Passage, Birmingham.

Neoplast. No. 584727. Class 50. Thermosetting and thermoplastic moulding compositions, electric lighting, heating and power fittings, &c.—Neosid, Ltd., 23-25, Hyde Way, Welwyn Garden City, Herts.